JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA,

FOR THE

PROMOTION OF THE MECHANIC ARTS.

NOVEMBER, 1858.

CIVIL ENGINEERING.

A few Remarks on Boiler Explosions and the Causes to which they are Attributed. By EDWARD STRONG.*

In the *Artizan* for the month of January I endeavored, in a few words, to bring before the notice of engineers the very unsatisfactory conclusions in many cases come to as to the causes of boiler explosions. Being aware that the views I hold on this subject were at variance with those held by many engineers, I felt it necessary at first to enter very cautiously on so important a snbject; but having had my opinions on this point corroborated by an eminent engineer—Mr. Roberts, of Manchester—I may venture to enter more fully into this.

We may take it as granted, that it is the wish and duty of all engineers, when one of these unfortunate accidents occur, to use every means in their power to trace out the true cause of the accident; and when commencing such an inquiry, it should be thoroughly understood that in all these cases the accident must have arisen from either a defect in construction, or neglect of the owners or parties in charge of the boiler. And bearing this strictly in view, I cannot see but that a satisfactory result should be come to; and the defect or neglect ascertained would be the information engineers require to avoid and remedy for the future. Adopting this system, in preference to that of endeavoring to envelope the case in mystery, we might hope to look forward to boiler explosions being very rare, instead of every-day occurrences.

Under the head of "mysteries" may be classed two theories: the

* From the London Artizan, August, 1858.

first, the supposition of an explosion of hydrogen gas, from the decomposition of water, from the plates of the boiler having become overheated; the second, from the same cause (overheating of the plates), the water having taken the spheroidical form. It will be necessary to treat these two theories separately before entering into plain, practical facts.

The opinion, and which I have often heard expressed by engineers, is that the plates of a boiler (no distinction being made between those of iron and copper) having become heated to redness from shortness of water, a gas is generated as explosive as gunpowder. Now, it can only be said, that under such circumstances, hydrogen gas, one of the ingredients of an explosive mixture, becomes present in the boiler; but in this state it is harmless, as pure hydrogen will neither ignite nor explode, and only becomes dangerous when mixed with certain proportions of air or oxygen gas, neither of which should be present in boilers working. It is therefore evident that this theory rests only on suppositions, commencing at first in doubt as to whether the very fact of the plates being heated to redness, and thereby weakened, may not from this cause have given way and caused the explosion; and ending in doubt as to whether or not the hydrogen gas could have become explosive by an admixture of air, and how this air had become present in the boiler. The whole of this theory should be thrown aside, as at best it can only be shown to be the result of a prior defect, which defect is the one to be looked for, as had it not existed the boiler plates would not have become heated: it is the real cause of the accident. This cause can be easily traced to a practical fault, namely—either the entire want or improper condition of the lead plug.

But, although iron heated to redness has the property of decomposing water, it must be thoroughly understood that copper has not, as copper will not decompose water at any temperature; therefore where the boiler is constructed of this metal, or, as in the case of a locomotive, where the fire-box is of copper and the tubes of brass, the decomposition of water from these parts being heated is impossible, and the theory must not be allowed to be applicable to such a case. This I saw unintentionally corroborated in an article on the relative evaporating powers of iron and brass tubes, which appeared in *The American Railroad Journal*, from which I make the following short extract: "Iron absorbs heat so much more rapidly than copper that many explosions have occurred which would not had copper been used; although it is admitted, it is too bad to praise copper for this also, that it will not let a boiler blow up. Copper cannot be a good medium through which to raise steam and a bad one to blow up." Now, copper has been proved to be a good medium through which to raise steam, being superior in this respect to iron; and its being a bad one to blow up is from the very fact that it will not decompose water, when from a defect the metal has become heated.

Water in the Spheroidical Form.—The supposition that boiler explosions have been caused by the water in the boiler having taken this form arises from this. If a plate of iron is heated to the temperature

at which water boils, or to certain degrees beyond this, water being then thrown upon it, evaporates in the form of steam, but if the plate is heated considerably beyond this temperature, the result is different, as water then thrown upon it ceases to evaporate in the form of steam, and takes the spheroidical form, which is that of rolling on the surface of the heated metal in globular forms. If this water is allowed to remain on the metal until the temperature of it is gradually reduced to the point when water ceases to remain in the spheroidical form, it then rapidly evaporates in the form of steam. It is therefore said that the plates of a boiler may have become so much overheated as to cause the water in contact with it to take the spheroidical form, and that the heat of the plates has afterwards become reduced to the point where the spheroidical form of water ceases, and that then the evaporation of steam becomes so great that an explosion must ensue. It is mere supposition that an explosion should follow, never having been proved by an experiment, and there is every reason to believe such should not result from this, which I will endeavor to show.

Water is said to take the spheroidical form at a temperature of 340°. Allowing this to be correct, the ordinary working pressure of locomotive boilers is 120 lbs.: to raise steam to this pressure a temperature of 343° is required; therefore water at this pressure must be in the spheroidical form, and, according to this theory, whenever the pressure falls say to 110 lbs., the water ceases to be in the spheroidical form, and an explosion should follow; which, I need hardly say, in practice does not take place. But if there is any doubt in this case, we can go still further. Engines have been worked with perfect safety at a pressure of 200 lbs., requiring a temperature of 385°. I have seen the pressure of steam in these boilers gradually reduced to 100 lbs., without the least perceptible result beyond the reduction of pressure. The pressure of steam in a boiler has been raised to 300 lbs., and afterwards reduced, without the least sympton of an explosion. These are facts of themselves sufficient to prove, that attributing boiler explosions to water having been present in the spheroidical form, is an absurd thing.

Water in boilers which are not stationary, must frequently be in the spheroidical form, without any explosion resulting, as from their motion it occurs that a portion of the plate exposed to the fire is left for a time without a covering of water; this portion of the plate gets overheated, and on the position of the boiler being again altered the flow of water returns, and is brought in contact with the overheated plate. I have never known an explosion result from this, and yet I have frequently seen this occur—as, for instance, a locomotive ascending a very steep incline, and immediately afterwards descending a steep decline. I do not mean to say, that with proper care—keeping the water sufficiently high in the boiler—this would have been; but it is well known that drivers do often let the water fall rather too low, and that water in the spheroidical form must frequently be present in the boiler. But it is evident that water being present in a boiler in this form, can never of itself be the cause of an explosion; and such being found, the theory should no longer be allowed to be brought forward as a means of accounting for such accidents.

If these two theories may be allowed to be finally disposed of, the inquiry becomes a simple affair, as we have thus only to deal with mechanical defects, and these may be classed under three heads, which are, firstly, *insufficient strength of boiler* (from whatever cause this may have arisen, whether from weakness in original construction, or worn so from being long in use, or from a neglected leakage, or plates injured by action of fire, from either an accumulation of dirt in boilers or insufficiency of water); secondly, a *defective safety-valve;* and lastly, a *defective lead plug*. All boiler explosions may with certainty be said to be caused by one of these three defects.

Insufficient Strength of Boiler.—As regards the construction of boilers, no rule can be laid down as applicable to all cases—so much depends upon the pressure and quantity of steam required to be generated; but, as regards the form of boilers, one rule may safely be applied to all—that is, to adhere as closely as practicable to the circular form in all the parts. With the large flat surfaces, weakness may be said to commence, for however well these parts may apparently be stayed, they are in nearly all cases the weakest part of the boiler, and the most likely to become deranged—the strain on the stays is always more or less unequal. Where the pressure of steam is high, and the quantity required to be generated great, it is always safer to increase the number of the boilers, rather than to increase their dimensions beyond certain limits. Of the strength of boilers, engineers should not be satisfied by only having ascertained, by their calculations, that the boiler they have constructed is of amply sufficient strength for what is required of it, when it thus leaves their hands *new;* but they should satisfy themselves that there is an excess of strength sufficient to compensate for the wear of the plates during the number of years boilers are in general considered workable. But even allowing that the calculations in all points have been correctly made, this is not of itself sufficient to insure strength, as flaws may exist in the metal which the most practised eye cannot detect, making all calculations valueless. The only means to insure against these defects is, testing the strength of the boiler by hydraulic pressure to at least double the pressure it is intended to be worked at. But for this to be an effectual safeguard against explosions from weakness of boiler, it is necessary that this testing be renewed periodically—say annually—which can very easily be done. One of the most common causes from which boilers become weakened is a neglected leakage; it may often be seen how a plate originally $\frac{3}{8}$ths inch thick is rapidly reduced to $\frac{1}{8}$th inch, by the corroding action of the water escaping from the faulty part. A leaky boiler may also be said to be an encouragement to the party in charge of it to allow an accumulation of dirt in the inside of it, as he finds the leakage less troublesome when the boiler is in this state, and thus the injury to the boiler increases, as where the dirt is, the water cannot be in contact with the plate, and then the action of the fire upon it is very injurious. This also greatly affects the steaming powers of the boiler, the dirt always being a bad conductor of heat. The parties in charge of boilers should be made to understand the great danger which ensues from a

leakage, however small, being allowed to continue, and also the necessity of keeping the plates of the boiler as clean as possible.

Defective Safety-valve.—It is absolutely necessary that every boiler should be fitted with a safety-valve; on no account should one safety-valve be allowed to act for two boilers, or, as is sometimes the case, for four or five; in all these cases each boiler is fitted with a stop-cock, which has the power of closing all communication between the boiler and safety-valve. It is therefore possible that, either from accident or neglect, this cock may be closed in one of the boilers in which steam is being generated: an explosion would then be inevitable. The danger of this system of construction is so plain to every one, that it may be supposed to be sufficient for its own remedy; yet it is not so, as this system is extensively in use; and what appears still more strange is, that even in the Government service it is adopted, or, perhaps more properly speaking, allowed. On the necessity of every boiler having a separate safety-valve, I would go still further, and say, each should be fitted with two, as in a locomotive. It is possible that one valve may become locked, but it is almost impossible that two can be so at the same time. I will not attempt to give an opinion as to which is the best arrangement of safety-valve to adopt, there are so many different plans, but those which are the most simple should be preferred, being less liable to become deranged. Explosions are frequently caused by safety-valves having become locked through a defect; these defects are various, although all leading to the same results. What would assist in preventing this would be making all the working joints of brass, which would not thus become corroded by the action of the steam. At present, the lever and working joints are of iron; they become so corroded by the continued action of the steam, that considerable force is often required to work them. It may be said that a brass lever would not be of sufficient strength, but this objection might be avoided by allowing the lever still to be of iron, and at the working joints to face and bush it with brass.

Safety-valves often become locked, although in perfect working order themselves, from a defective arrangement of the spring balance; this is an error which is unfortunately very common. If we take an ordinary spring balance, constructed, say to work at a pressure up to 120 pounds, in screwing it down to this pressure it will be seen that the index finger is brought within $\frac{1}{8}$th of an inch of the guard at bottom of balance; this, with the ordinary arrangement of lever, gives only $\frac{1}{40}$th of an inch for the valve to rise; and even this is not its most dangerous feature, as if the connecting rod to which the balance is attached is not adjusted with the greatest exactitude, but left $\frac{1}{8}$th of an inch too short, on the nut of balance being screwed home the index finger rests on the guard of balance; thus the safety-valve becomes effectually locked. I have known lives lost from an explosion which I could only attribute to this, which might be thought trifling defect. The index finger should always be at least one inch clear of the bottom guard of balance, after the nut is screwed home.

One of the safety-valves of a boiler should always be within easy

reach of the person in charge, so that he may frequently try if the valve is working freely.

Defective Lead Plug.—To this cause should be attributed all boiler explosions from overheated plates. The safety of the boiler depends as much upon the lead plug being in proper condition, as upon the state of the safety-valve. Men may neglect their duty and allow the water to fall too low, but when the boiler is fitted with a proper lead plug, the most serious result which can follow this neglect is the fire being extinguished. A lead plug to be in proper condition should be renewed monthly, and of sufficient size, not less than one inch; where they are thus used, the overheating of a boiler from scarcity of water is a matter of impossibility. But notwithstanding this, the lead plug has got into disrepute, not from any defect of its own, but from neglect or ignorance of those whose duty it should have been to have seen it kept in proper condition. The result of this is, that a number of boilers are now not fitted with lead plugs, or else where they are fitted in at first, they are afterwards so much neglected as to be perfectly useless when their safe action is required. The proper use of the lead plug should be insisted upon as one of the greatest means of safety.

The means to be adopted for preventing boiler explosions may be summed up in these few words: the strength of the boiler to be annually tested by hydraulic pressure to double its working pressure; a leakage, however small, to be at once stopped; the boiler kept clean; the boiler to be fitted with two safety-valves, and a led plug kept in proper condition. Where these directions are strictly attended to, a boiler explosion may be said to be an impossibility.

---

*On the Navigation of Canals by Screw Steamers.**

By Neil Robson, C. E.

Paper read at the Institution of Engineers in Scotland.

It is not the object of this paper to go into any lengthened history of the various modes of haulage that have been tried on canals in general, but rather to collect and make known to the members of the Institution some facts connected with recent successful attempts to introduce screw propulsion on the Forth and Clyde Canal, with which the author is best acquainted, and which, as is well-known, is one of that principal arteries of inland navigation in Scotland. And by so doing, to direct the minds of the ingenious mechanical engineers of which the society is composed to the great importance of the subject, and to elicit opinions as to its farther development, with a view to improve the mechanical details and arrangements of the power employed.

But whilst this is the chief object of the author in bringing the subject before the Institution, he will venture to digress so far as to introduce a few preliminary observations on inland navigation in general, and will briefly notice a few of the English canals on which this new mode of haulage has been tried and is now in use. The several experi-

* From the London Civ. Eng. and Arch Jour., Septmber, 1858.

mental attempts which have been made to introduce other modes of haulage on the Forth and Clyde Canal will then be given somewhat in detail, and the paper will be brought to a close by a description of the system now being introduced on that canal; reference being made to drawings illustrative of the boat *Thomas* and her engine, with which the first really successful experiment was made, under the canal company's more immediate control, with the advice and under the superintendence of their officers. In the concluding remarks the author will contrast the expense of horse and steam haulage, as brought out by the results so far as they have gone.

It cannot be denied that since the introduction of railways, canals, which prior to that event formed the principal mode of conveyance for a very large proportion of the goods and mineral traffic of the country, have been thrown into the shade; and that the attention of practical men has been more devoted to the development of railway traffic, not only as regards the mechanical appliances for its transit, but also as regards the acquisition and carrying of large quantities of merchandise and minerals, than to the improvement of the more ancient mode of conveyance.

There is no good reason however why this should be so; for although in some cases canals may be the avowed rivals of railways, in others, they are or might be made the means of feeding their traffic, or of relieving them of a portion of the heavy merchandise and mineral traffic which railways cannot always carry with advantage to themselves. It does not follow that because a railway may be carrying a large amount of tonnage it is doing so profitably; on the contrary, it is to be feared that in many cases, if the cost were fairly set against revenue, the result would be found quite the reverse; the rates obtained being inadequate to meet the greater wear and tear of the iron road, as compared with the water-way, and the many sources of expense to which railway plant is subjected. For passengers and for light and perishable goods, and for goods requiring quick despatch, canals never can or ought to compete with railways; but for bulky and heavy goods and minerals, the author is convinced that they can and will maintain their ground, provided their managers keep pace with the improvements and requirements of the day.

In Great Britain and Ireland, the total length of canal and inland navigation is about 4000 miles; and it is estimated there has been expended in the construction and improvement thereof at least £50,000,000 sterling. These figures of themselves sufficiently demonstrate the importance, in a national point of view, of this great interest.

For the most part, canals carry on toll; that is to say, they are open to any trader, however small, who chooses to send his own boat with horses to tow it, on payment of the fixed rate of toll; and in this respect they are similar to turnpike roads. In a few instances canal companies act as carriers on their own account, but it is questionable how far they do wisely in this. It consists with the author's knowledge that the Forth and Clyde Company, who ceased altogether to be carriers about five years ago, except to a very small extent, have made more

money by falling back on their simple province of keeping the canal in repair, and acting as recipients of toll.

It appears that the first attempt to propel boats by the screw on the English canals was made about twenty years ago between London and Manchester; but from the number of locks, there being about one to every mile, and from the narrowness and want of depth of the canals which compose that route, it was not so successful as to lead to any practical result at the time. Within the last three or four years, navigation by screw boats has been introduced on the Aire and Calder navigation, on the Leeds and Liverpool Canal, and on several others in that country; and so far with success. The best practical results as regards speed and economy of working is obtained on those canals of which the depth is not less than 6 feet; breadth at water level 50 feet, and at bottom about 35 feet; but as the majority are of less size, it is to be hoped that the time will come when screw propulsion may be applied with advantage on our shallowest and narrowest canals; and to that end, the bringing of the subject to the notice of such meetings as this will no doubt tend.

The first attempt to move a vessel by steam on the Forth and Clyde Canal was made about the beginning of the present century, and it appears that Mr. Symington was connected with the fitting up of the boat. This boat was propelled by two paddle wheels close together at the stern, with the driving cranks between them. It ran for some little time; but its chief merit was considered to lie in its being an ice breaker, for which it answered admirably. Although the records of the canal do not mention the fact, there can be little doubt that this was the *Charlotte Dundas*, constructed by Symington in 1802, and with which he made one of his first essays in steam navigation.

In 1828, the *Cyclops*, a boat for carrying passengers, was fitted up as a steamer with paddle-wheels at the stern. She was 64 feet long, 16 feet broad, and 6 feet deep; carried about 40 tons of goods, and went about 3½ miles per hour on the canal, and about 6 miles on the Firth of Forth.

In 1831, the *Manchester* steamer was built, propelled likewise by one wheel at the stern. She carried from 50 to 60 tons of goods, and steamed about 4½ miles on the canal, and 7 miles on the Firth.

The *Lord Dundas* was also built in 1831 as a passenger boat. She had two paddle-wheels, one on each side of the stern, and steamed about 7½ miles an hour on the canal.

All these boats ceased to be used on account of the cost of working being greater than horse haulage, and from constant failures in the machinery.

It was proposed at one time, and actually tried, to haul vessels on the canal by laying a chain along the bottom, to be acted upon by a pulley in the boat; the pulley being worked either by hand or steam power.

Another experiment was the laying down a line of railway on the towing path, on which a locomotive engine ran and hauled boats behind her; a previous trial for hauling them by a locomotive for common

roads running on the towing path having signally failed, as might reasonably have been expected.

In 1844, a Mr. Kibble patented a paddle-wheel composed of a number of float-boards fastened on an endless chain working round two drums. It was thought that this mode of propulsion was well adapted for canals, and a boat fitted with a paddle of this description on each side was tried, but given up on account of the expense.

The late Mr. Smith of Deanston had a plan which he intended for the small canals in the West Indian Islands, of having a wheel passing through and projecting below the bottom of the boat, so as to run on the bottom of the canal and thus haul the boat. This plan was tried on a reach of this canal about ten years ago, but did not answer.

In addition to these, the author understands that several attempts were made to introduce steam on the Union and Monkland Canals, which communicate with the Forth and Clyde Canal, but are of less depth and width. In 1846, a steamer with double screws was tried on the Union. In 1845, a steam-tug built by Mr. Wm. Napier, Jr., was tried on the Monkland Canal.

From some cause or other it appears that all these attempts, not only on the Forth and Clyde but on other canals running into it, were more or less failures; and that it is only within the last two years that anything like a systematic carrying out of steam propulsion has been accomplished. The available depth of water on this canal is about 8 ft. 6 ins.; average width at water surface 60 feet; and at bottom from 30 to 40 feet. Its length is 39 miles, and there are 40 locks, the dimensions of which are—length, 70 feet; width, 20 feet; and least depth on sill, 9 ft. 4 ins. The Monkland Canal, now amalgamated with it, is 12 miles long, but its available depth is only about half that of the Forth and Clyde; width at water surface, 40 to 50 feet; and at bottom, 25 to 30 feet; length of lock, 70 feet; width, 13 ft. 6 ins. The total merchandise and minerals conveyed on the main canal and its Monkland branch, is upwards of two millions of tons per annum.

At present there are five screw steamers, belonging to different traders, daily at work on the main line, and one belonging to the canal company, who are also fitting up another with screw machinery to serve as an ice-breaker, and have drawings in progress for engines to be fitted to a canal and sea-going steamer.

The lighter *Thomas*, to which this paper more particularly refers, was not originally built for being fitted with the screw, nor is she of a class adapted for going out into the Firth, but nevertheless she may be taken as a fair sample of a large class of lighters in use on the canal. She is 66 feet long; 16½ feet broad; draws about 6½ feet of water; and carries from 70 to 80 tons of cargo. The screw lighters belonging to the traders are larger, and are fitted to navigate the Firths of Clyde and Forth as well as the canal, and to carry from 100 to 120 tons of cargo.

The engine and boiler of the *Thomas* are placed in the stern, behind the bulkhead, which partitions off the stern portion to the same extent as the stern portion of the other lighters of the class which is used

for horse haulage; and this space, small though it is, is found amply sufficient for the boiler, engine, and coal bunker, with room for attending the engine and stoking the boiler. The weight of the engine, boiler, and propeller, including 13 cwt. of water, does not exceed 3 tons. The dimensions of the boiler and engine are as follows, viz:—

Inside diameter of body of boiler, 3 feet; and swelled to 3 feet 5 inches at surface water line. Height of boiler from fire-bars to crown, 7 feet 3 inches. The boiler is furnished with 54 brass tubes of the average length of 3 feet 5 inches; and tapered from $2\frac{1}{4}$ inches diameter inside at the fire-box tube plate, to $1\frac{3}{4}$ inches inside diameter at the uptake tube plate; which give the heating surface in fire-box and tubes as follows, viz:—

	Square feet.
Fire-box, 2 feet 6 inches by 1 foot 6 inches,	11·78
" tube plate,	2·54
Total fire-box surface,	14·32
54 tubes 3 feet 5 inches long and 2 inches average diameter,	96·60
Total heating surface,	110·92

	Ft.	ins.
Diameter of cylinders,	0	$6\frac{1}{4}$
Stroke of piston,	0	10
Valves worked by link motion, extreme throw,	0	3
Diameter of screw propeller,	3	6
Pitch of screw,	4	0

The engine cylinders are bolted together, forming the steam chest between them, in the usual way. The cylinders lie on the bilge of the lighter, and their connecting rods are attached directly to cranks at right angles to each other on the engine shaft, which is coupled to the propeller shaft. The screw of 4 feet pitch at 130 revolutions per minute gives a speed of five miles an hour, while the advance of the screw due to the speed is 5·909 miles per hour, showing a slip of the screw of $\frac{2}{13}$ths.

It is found that 35 lbs. per square inch of pressure in the cylinders is sufficient for propelling the lighter with a full cargo of from 70 to 80 tons. In breaking through the ice on the canal in December, 1856, the boiler was worked up to 85 lbs. pressure, and at that pressure the boiler was more than capable of supplying the cylinders with steam. The contracted area of the water surface gave rise to a suspicion that the boiler might be liable to prime, and after some experiments with a glass model boiler, it was resolved to fit in a current plate round the inside of the boiler shell. Without estimating the merits of the current plate, it may be stated that the boiler is quite free from priming with the steam taken from the crown with a $1\frac{1}{2}$ inch pipe. The taper tubes were deemed a desideratum, with the view of obtaining an increased influence from the fire throughout the short distance it has to pass from the furnace to the uptake, and also to allow the upper tube plate to be reduced in diameter, thereby increasing the surface of the water in the boiler.

On a late trial of four trips from Port Dundas to Bowling (a distance

of 12 miles) and back, making a distance of 96 miles run, passing through 144 canal locks, and getting up steam 8 times, the consumption of coal (good Monkland soft coal) was 1 ton 3 cwt.; which at average length of runs on the Forth and Clyde Canal might be stated to be equal to 100 miles steaming by one ton of coals.

As the engines were fitted to the lighter as an experiment, it was deemed desirable to make them of sufficient power to tow another lighter of similar size, which they were quite able to do: but the traffic the lighter is at present employed in does not afford opportunities for using the surplus power in towing an additional boat.

The boiler has been proved to be so capable of raising steam, that the canal company have contracted for two similar boilers with iron tubes, to supply steam to two 9½ inch cylinders with 15 inch stroke of piston. These are to be fitted to an ice-breaker, which is also used for the surface of the canal works.

The lighter has been constantly at work for the last fifteen months between Port Dundas and Bowling, a distance of 12 miles, carrying general merchandise in connexion with the Dumbartonshire Railway, and without losing a single trip through any accident, injury, or repair of the machinery. The only alteration made in the machinery was the substitution of cast iron valves for brass valves, and the only mishap which has befallen any part of the working gear was the breaking of one of the arms of the screw propeller. She can easily make three trips a week, and usually performs the voyage each way in four hours, when not detained at the locks by the passing trade; which, including the detention in passing through the eighteen locks, is at the rate of 3 miles an hour, but when fairly clear of the locks her average speed is 5 miles per hour.

There is very little additional swell or washing of the banks at this speed, and on the whole there does not appear to be any appreciably greater wear and tear of the canal than that arising from the passage of boats drawn by horses,—at all events, no more than would be compensated for by the saving in upkeep of the banks, in having no towing path to uphold were horse haulage done away with.

Altogether the result proves that by means of the screw the navigation of canals by steam is perfectly practicable. But it is still doubtful how far this power can be applied to propel, with advantage, more than the boat in which the engine is placed, owing to the difficulty of steering boats towed behind, especially in narrow canals; and to the circumstance that when the tug with its train of boats approached a lock, each would have to be disconnected and taken through singly. The author inclines to the belief that, as a general rule, an engine must be put in each boat. That this can be done with advantage with boats for goods, he thinks he has proved; but the problem has still to be solved, whether the system can be profitably applied to boats carrying minerals alone on such canals as the Monkland, of which the available depth is only 4½ feet, and the width proportionably small. These boats, or "scows" as they are termed, carry on an average 55 tons; are in length 66 feet, width 13 feet 4 inches; cost, built of iron,

about £250; and are usually hauled by one horse. The speed when loaded is about 2 miles an hour clear of the locks, and going back empty it is a little more.

It is obvious that if every such coal boat must have an engine for itself three things will be required. 1. The machinery must occupy little room, in order to leave space for the cargo. 2. The first cost must be small. 3. Its working must be economical, both as regards repairs and consumption of fuel. The author does not despair of seeing all these accomplished, and hopes that the time is not far distant when the haulage even of coal scows will be done more cheaply than by horses.

Meantime he wishes it to be understood that the following comparison of the cost of the two systems applies exclusively to the results obtained from the experiments with the *Thomas*, running to and from Bowling with goods, and being somewhat in favor of steam, may be accepted as a good omen that better results will yet be obtained. For although this portion of the canal is favorably adapted for steaming, so far as depth and width are concerned, yet, owing to the great number of locks, and detention there, it is in other respects less favorably adapted than other portions, where the reaches are longer and the locks fewer.

Comparison of Cost of Horse and Steam Haulage. Horse Haulage to and from Bowling. Goods Lighter.

	£	s.	d.
One master, per week,	1	1	0
One mate "	0	18	0
One horse and one man tracking, and making two trips per week,	1	8	0
Ropes for tracking,	0	2	0
	3	9	0
Add interest on cost of lighter, £450, at 5 per cent., and for repairs and depreciation 7½ per cent. on same amount, per week,	1	1	7½
Total per week,	£4	10	7½

Thus at two trips per week, £4 10*s.* 7½*d.* divided by 48 miles gives 1*s.* 10½*d.* as the cost per mile per boat load of 75 tons, or $\frac{3}{10}$ths of a penny per ton per mile.

The same with steam.

	£	s.	d.
One master, per week,	1	1	0
One mate "	0	18	0
One engine-driver	1	0	0
Oil, tallow, and gasket, per week,	0	3	8
15¾ cwt. of coals per week,	0	5	6¼
	3	8	2¼
Add interest on cost of lighter, £450, engine £320, together, £770, at 5 per cent., and 7½ per cent. on the same sum for repairs and depreciation,	1	17	0¼
Total per week,	£5	5	2½

Thus at three trips per week, £5 5*s.* 2½*d.* divided by 72 miles gives

1*s.* 5½*d.* as the cost per mile per boat load of 75 tons, or $\frac{2\,3}{1\,0\,0}$ths of a penny per ton per mile.

From the slow rate of trackage by horses, no more than two trips per week are got, while with steam three trips are easily made; and hence arises a very considerable part of the above saving in favor of steam power.

From these figures it appears that the cost by steam haulage is at the rate of 17·5 pence per boat load per mile, or $\frac{2\,3}{1\,0\,0}$ths of a penny per ton per mile; and by horse haulage, 22·5 pence per boat load per mile, or $\frac{3}{1\,0}$ths of a penny per ton per mile; including in either case an allowance for tear and wear, and repairs, and interest on the price of the boat, and the same on the machinery in the case of steam. These rates are calculated on the supposition that the full load of 75 tons is carried both ways, but as that will not always be so in practice, the cost will generally be somewhat higher, whether by steam or horse haulage. And when the boat is only loaded in one direction and comes back empty, the cost will of course be still higher.

—

In the discussion which followed, it was remarked by Mr. Robson that the paper showed how the navigation of canals by steam had been effected at a less cost than by horse haulage in one particular instance. It would be observed, that in the *Thomas*, with which this result had been obtained, the engine and boiler were put into a very small space at the stern. If, however, steam power was to be rendered applicable to canals of very small depth, like the Monkland, the engine and boiler would have to be squeezed into a still smaller space. He confidently expected this would be done, and it was one of the objects of his paper to bring this point before the Institution, in the hope of eliciting a suitable plan from some of the ingenious mechanical engineers amongst its members. If the system was to be applied to coal scows, it was necessary that the engine, boiler, and propeller should not cost more than £150.

Mr. Milne, the engineer and superintendent of the Forth and Clyde Canal, stated, that at the low speed of five miles per hour of the *Thomas*, no appreciable wave was raised in the canal. If that speed was exceeded, a wave would rise; but at a speed of five miles and under, the canal banks were unaffected. That speed was quite sufficient for all the purposes of the traffic. The engine of the *Thomas* was sufficiently powerful to carry a much larger cargo than the present boat was capable of taking. He thought the efficiency of the boiler arose in some measure from the use of the tapered tubes. He had had considerable difficulty in getting such tubes; but he had recently succeeded in obtaining tapered iron tubes, a specimen of which he exhibited, and he intended to use them in future. The heating surface in the *Thomas's* boiler was 1·8 foot per superficial inch of piston, whilst in a number of locomotives with which he was acquainted it was on an average 2·8 ft.

It was asked if the different traders could be got to bring their boats punctually at the time appointed for starting the trains? Mr. Milne

thought that this was one of the great difficulties connected with trains of boats; several traders could never be depended on to have their boats ready at the proper times. But the greatest difficulty with trains would be at the locks; the boats would have to be detached and passed through one at a time, and when boats were passing in the opposite direction, further delay would be caused; as if the going boats claimed the lock each time it was full, the returning boats would claim it each time it was empty.

It was remarked that, in the comparison given in the paper between steam and horse haulage, the latter had been put down at $\frac{3}{10}d.$ per ton per mile. In the case of minerals, the cost of horse haulage was, in many cases, not more than $\frac{1}{8}d.$ per ton per mile.

Mr. MILNE stated, that in the case from which the data for comparison were derived, there were only two-thirds of the mileage that was generally got with minerals. There were three locks every two miles on the canal between Port Dundas and Bowling; whilst on the mineral canals where the horse haulage was so low, the number of locks was much less; besides, the coal scows met with much less detention, when loading and unloading, than boats carrying a general goods cargo.

Mr. ROBSON said he was aware of instances where the cost of horse haulage was as low as $\frac{1}{8}d.$ per ton per mile. In one set of figures he had seen it $\frac{1}{6}d.$ per ton per mile, and he had thought it would be difficult to do it more cheaply. However, he had seen reason to alter this opinion. In horse haulage, the number of trips was limited, whilst with steam, one-third more trips could be got with a boat.

Mr. MILNE was satisfied that with steam they would be able to carry at two-thirds of the cost of horse haulage, under any circumstances. Horses could not last beyond a certain time, whilst with $7\frac{1}{2}$ per cent. set aside for repairs, the duration of an engine might be said to be unlimited.

Prof. RANKINE observed, that Mr. Robson's paper was a most important one. Canals were the best means of conveyance for heavy goods of small value for their weight, at low speeds, on account of the small propelling power required, and the consequent small cost. They had been neglected of late years, but undeservedly so, and it was gratifying to see them again attracting attention. Steam power had been found advantageous in every other application, and he thought it would eventually prove so in this. As mentioned in the paper, many schemes had been tried; amongst others was that of warping, by means of a chain lying along the bottom of the canal. He believed this plan had been used with advantage in tunnels where there was no towing-path; but he thought it must be expensive. He thought it a pity that some other ingenious projects that had been formed had not been tried. There was one in particular, invented by Mr. Charles Liddell, in which fixed engines and wire ropes were to be used, and which would probably give very good results, if the traffic was sufficiently great to keep the apparatus continually at work. The case of the *Thomas*, detailed in the paper, was one of the first, if not the only instance, in which steam power had been applied with practical economy.

*Duty of Steam Engines.**

The following interesting practical examples of the difference between the actual and the theoretic duty in different descriptions of engines is extracted from an admirable paper by Prof. Thomson on the dynamic theory of steam, published in the Edinburgh Philosophical Transactions of 1850, 1851:

"1. The engine of the Fowey Consols mine was reported in 1845 to have given 125,089,000 foot-pounds of effect for the consumption of one bushel or 94 lbs. of coal. Now the average amount evaporated from Cornish boilers by 1 lb. of coal is 8½ lbs. of steam; and hence for each pound of steam evaporated 156,556 foot-pounds of pressure are produced.

"The pressure of the saturated steam in the boiler may be taken as 3½ atmospheres, and consequently the temperature of water will be 150°. Now by Regnault (end of Memoire x,) the latent heat of a pound of saturated steam at 140° Cent. is 508, and since, to compensate for each pound of steam removed from the boiler in the working of an engine, a pound of water at the temperature of the condenser (which may be estimated at 30°) is introduced from the hot well; it follows that 618 units of heat Cent. are introduced to the boiler for each pound of water evaporated. But the work produced for each pound of water evaporated was found above to be 156,556 foot-pounds; hence, $\frac{156,556}{618}$, or 25·3 foot-pounds is the amount of work produced for each unit of heat transmitted through the Fowey Consols engine.

"2. The best duty on record as performed by an engine at work (not for merely experimental purposes) is that of Taylor's engine at the United Mines, which in 1840 worked regularly for several months at the rate of 98,000,000 foot-pounds for each bushel of coal burned; this is $\frac{98}{125}$ or ·784 of the experimental duty reported in the case of the Fowey Consols engine.

"Hence, the best useful work on record is at the rate of 198·3 foot-pounds for each unit of heat transmitted, and is $\frac{198·3}{440}$, or 45 ℔ cent. of the theoretical duty, on the supposition that the boiler is at 140° and the condenser at 30°.

"3. French engineers contract (in Lille, in 1847, for example,) to make engines for mill power which will produce 30,000 metre-pounds or 98,427 foot-pounds of work for each pound of steam used. If we divide this by 618, we find 159 foot-pounds for the work produced by each unit of heat. This is 36·1 ℔ cent. of 440, the theoretical duty.

"4. English engineers have contracted to make engines and boilers which will require only 3½ lbs. of the best coal per horse power per

* From the Lond. Civ. Eng. and Arch. Journ., Sept., 1858.

hour. Hence, in such engines, each pound of coal ought to produce 565,700 foot-pounds of work, and if 7 lbs. of water be evaporated by each pound of coal, there would result 80,814 foot-pounds of work for each pound of water evaporated. If the pressure in the boiler be $3\frac{1}{2}$ atmospheres (temperature 140°), the amount of work for each unit of heat will be found, by dividing this by 618, to be 130·7 foot-pounds, which is $\frac{130{\cdot}7}{440}$ or 29·7 ℔ cent. of the theoretical duty.

"5. The actual average of work performed by good Cornish engines and boilers is 55,000,000 foot-pounds for each bushel of coal, or less than half the experimental performance of the Fowey Consols engine, and scarcely more than half the actual duty performed by the United Mines engine in 1840; in fact, about 25 ℔ cent. of the theoretical duty.

"6. The average performance of a number of Lancashire engines and boilers have been recently found to be such as to require 12 lbs. of Lancashire coal per horse power per hour (*i. e.*, for performing $60 \times 33{,}000$ foot-pounds), and a number of Glasgow engines such as to require 15 lbs. (of a somewhat inferior coal) for the same effect. There are, however, more than twenty large engines in Glasgow at present, which work with a consumption of $6\frac{1}{2}$ lbs. of dross, equivalent to 5 lbs. of the best Scotch or 4 lbs. of the best Welsh coal, per horse power per hour. The economy must be estimated from these data, as in the other cases, on the assumption, which with reference to these is the most probable we can make, that the evaporation produced by a pound of best coal is 7 lbs. of steam.

"The following tables afford a synoptic view of the performances and theoretical duties in the various cases discussed above.

"In table A the numbers in the second column are found by dividing the numbers in the first by $8\frac{1}{2}$, in Cases 1, 2, and 5; and by 7 in Cases 4, 6, and 7, the estimated numbers of pounds of steam actually produced in the boilers by the burning of one pound of coal.

"The numbers in the third column are found from those in the second by dividing by 618 in Table A, and 614 in Table B, which are respectively the quantities of heat required to convert a pound of water taken from the hot-well at 30° into saturated steam in the boiler at 140° or at 121°.

"With reference to the Cases 3, 4, 6, 7, the hypothesis of Table B is probably in general nearer the truth than that of Table A. In 4, 6, 7, especially upon hypothesis B, there is much uncertainty as to the amount of evaporation that will be actually produced by one pound of fuel. The assumption on which the numbers in the second column in Table B are calculated is, that each pound of coal will send the same number of units of heat into the boiler, whether hypothesis A or hypothesis B be followed. Hence, except in the case of the French contract—in which the evaporation, not the fuel, is specified—the numbers in the third column are the same as those in the third column of Table A.

TABLE A.—*Various Engines in which the Temperature of the Boiler is* 140° *Centigrade, and that of the Condenser* 30° *Centigrade.**

Theoretical duty for each unit of heat transmitted, 440 foot-pounds.

CASES.	Work produced for each pound of coal consumed.	Work produced for each pound of water evaporated.	Work produced for each unit of heat transmitted.	Percentage of theoretical duty.
	Foot-pounds.	Foot-pounds.	Foot-pounds.	
1. Fowey Consols experiment, reported in 1845, . . .	1,330,734	156,556	253·0	57·5
2. Taylor's engine, at the United Mines, working in 1840, . .	1,042,553	122,653	198·4	45·1
3. French engines, according to contract, ...	—	98,427	159·0	36·1
4. English engines, according to contract, ...	565,700	80,814	130·8	29·7
5. Average actual performance of Cornish engines, . . .	585,106	68,836	111·3	25·3
6. Common engines, consuming 12 lbs. of best coal per hour per horse power, ...	165,000	23,571	38·1	8·6
7. Improved engines with expansion cylinders, consuming an equivalent to 4 lbs. of best coal per horse power per hour, . . .	495,000	70,710	114·4	26·0

TABLE B.—*Various Engines in which the Temperature of the Boiler is* 121°,† *and that of the Condenser* 30°.

Theoretical duty for each unit of heat transmitted, 371 foot-pounds.

CASES.	Work produced for each pound of coal consumed.	Work produced for each pound of water evaporated.	Work produced for each unit of heat transmitted.	Percentage of theoretical duty.
	Foot-pounds.	Foot-pounds.	Foot-pounds.	
3. French engines, according to contract, ...	—	98,427	160·3	43·2
4. English engines, according to contract, ...	565,700	$\frac{6}{6}\frac{14}{18} \times 80{,}814$	130·8	35·0
6. Common engines, consuming 12 lbs. of coal per horse power per hour,	165,000	$\frac{6}{6}\frac{14}{18} \times 23{,}571$	38·1	10·3
7. Improved engines, with expansion cylinders, consuming an equivalent to 4 lbs. of best coal per horse power per hour, . . .	495,000	$\frac{6}{6}\frac{14}{18} \times 70{,}710$	114·4	30·7

* 1° Centigrade = 1·8° Fahrenheit.

† Pressure 15 lbs. on the square inch.

In the following estimate of the theoretical duty of engines worked with initial pressures of 150 and 90 lbs. respectively, and cutting off at $\frac{1}{10}$ and $\frac{1}{6}$ the stroke respectively, Mr. Prideaux has taken into account the increment of effect due to the infiltration of the expanding steam with heat from the steam-jacket, and compared the estimated theoretical duty with the actual performance of the best Cornish and marine engines.

	lbs.
"Steam of 150 lbs. cut off at 1-10th will exert a mean pressure of .	49·50
Allow 10 per cent. for increase in elasticity, from steam becoming sub-saturated, with 46° surplus heat, and a tension of 18 5 lbs. at the end of the stroke, ...	4·95
Vacuum, ...	12·00
Total, . . .	66·45

lbs. lbs.
66·45 × 144 = 9568·8 raised 1 foot, by one cubic foot of atmospheric steam + 46° of heat.

lbs. vol. of steam.
9568·8 × 1669 = 15,970,327 raised 1 foot, by the conversion of 1 cubic foot of water into steam of 150 lbs. = the addition to one cubic foot of water at 100° of 1078·8 + 46° of heat.

	lbs.
Steam of 90 lbs. cut off at 1-6th will exert a mean pressure of	42·0
Allow 10 per cent. for increasad elasticity, from steam becoming sub-saturated, with 34° surplus heat, and a tension of 18 lbs. at end of stroke, ...	4·2
Vacuum, ...	12·0
Total, . . .	58·2

lbs.
58·2 × 144 = 8380·8 raised 1 foot by one cubic foot of atmospheric steam + 34° of heat.

8380 8 × 1669 = 13,987,552 raised 1 foot by the conversion of 1 cubic foot of water into steam of 90 lbs. = the addition to 1 cubic foot of water at 100° of 1078·8° + 34° of heat.

A cubic foot of water weighs 62·32 lbs.; allowing 5 lbs. of coal to evaporate this quantity (= 12·464 lbs. per pound of coal—and 12·9 has been done), we get as the theoretical duty of one pound of coal:

	lbs.		lbs. of coal. per H. P. per hour.	Per centage of duty.
In the engine with initial pressure of 150 lbs. and cutting off at 1-10th,	3,194,065	raised one foot =	·62	100·00
In engine with initial pressure of 90 lbs. and cutting off at 1-6th,	2,797,511	"	·70	87·58
Utmost duty known to have been performed by a Cornish engine,	1,329,787	"	1·48	41·63
Common amount of duty for a superior Cornish engine, .	1,000,000	"	1·98	31·30
Average duty of Cornish engines,	750,000	"	2·64	23·48
" best marine "	450,000	"	4·4	14·09"

It has been already said that the best expansive engines have never realized in practice more than 60 ℔ cent. of their theoretical duty. As regards the *composition* of such loss of 40 ℔ cent. Mr. Pole found, that if an engine of that kind expanding 3½ times were absolutely perfect,

each unit of heat given out by the combustion of the fuel ought to develope about 134 units of work; but the amount actually produced in the shape of water raised was only about 80 units, or 60 ℔ cent. less than the theoretical result. He had endeavored to discover at what parts of the engine this loss occurred, and had found it might be distributed about as follows:

Imperfect combustion and other causes of waste of heat in the boiler,	12½
Heat expended in raising the temperature of the feed water to a boiling point, ...	12½
Friction, imperfect vacuum, air pump, &c., or power wasted in working the engine, ...	15
	40
Useful effect realized, . . .	60
Total calorific power of the engine, .	100

The friction of the machinery of a locomotive engine has been experimentally determined by De Pambour at $\frac{1}{11}$ of the tractive force it exerts, and this exactly coincides with the results of Mr. Pole's analytical investigation of the friction of the direct-acting marine engine with slides. This is of course exclusive of the resistance of the air-pump, and of the friction caused by the pressure (when unbalanced) of the steam on the back of the slide valve.

For the Journal of the Franklin Institute.

The Barometer as an Engineering Instrument.

By JOHN M. RICHARDSON, B. S.

One of the first duties of an engineer after taking charge of any proposed line of railway, plank road, or canal, is to make himself thoroughly acquainted with the physical features of the country between the termini of the same. He should know every forest and cultivated field, every mountain and plain, every river and rivulet, every valley and every range of hills. All these should be as indelibly engraved upon his mind as upon a map. Indeed, he should be as familiar with every feature of the country over or through which the improvement is to run, "*as though he had passed his hand over every foot of it.*" Such precise information can only be gained by a close and careful instrumental survey, using for that purpose the level, chain, and compass. These surveys, however, are very expensive, costing both time and money; and as several routes are usually surveyed, whilst only one is finally adopted, it follows, that if any feasible method can be suggested whereby the number of these surveys may be diminished there will be a great saving of both the important elements, time and money; or, since in this utilitarian and practical age, time is money; the saving may be regarded as one of money alone.

It is firmly believed that a proper use of the barometer in all reconnoissances will lessen the number of experimental lines usually survey-

ed, facilitate the location of the road or canal, hasten its construction, and thus confer a benefit upon the public.

Before setting any survey on foot, it is the usual custom for the chief to pass over the proposed line and examine it with the eye alone, selecting "guiding" or "ruling" points through which the road must pass, and gaining all possible information with regard to the country from the inhabitants along the route. The knowledge thus obtained is of great importance, and its benefit is felt when the more careful and accurate observers, the level and chain, follow after, noting with the utmost minuteness every change of grade. But the eye is a very unsafe engineering instrument, and should not be too implicitly relied upon when used without the aids which science and art have given it. It is true that by long practice, some can judge pretty correctly as to the distance of two objects apart, or as to their relative difference of level so long as they both remain in sight: but when space, and forests, and mountains intervene between two stations, A and B—especially if there be a succession of ascents and descents between the two—an engineer, aided by the eye alone, cannot say with any certainty when he has arrived at B, "I am below A," or "I am above A," except in one case, viz: when he has been following the course of a stream. In confirmation of this, two facts will be detailed. The writer was once traveling over a very rough and broken portion of country in company with an experienced and distinguished engineer; they passed from the valley of one stream to that of another nearly parallel to the first, and at about right angles to their direction. The road along which they journeyed ran over a succession of ranges of hills, so that they kept ascending and descending; but as far as they could judge, the ascents and descents appeared to balance each other; and when they arrived at the second stream, they thought they were about on a level with the one they had left. Upon examination, however, the difference of level of the two streams proved to be over two hundred feet! The engineer alluded to, who was formerly an officer in the U. S. A., and who is well known as an able topographer and skilful engineer, exclaimed vehemently against the reliance of engineers upon the unaided eye in reconnoissances of long lines. The second fact is quoted from Lieut. R. S. Williamson's "Report" of explorations made by him in California, to aid in solving the problem relative to the practicability of the "Pacific Railroad." This Report will be referred to hereafter, though enough will be extracted now to answer another as well as the present purpose.

I will now give the results of the survey, merely mentioning here that the profile, as determined by the spirit-level and barometer, agreed remarkably well.

"From the Depôt Camp to the point where the Tejon Creek debouched from the mountains was a distance of two and eight-tenths miles, over unbroken ground. *To the eye this appeared very slightly deviating from horizontality. The level showed a difference of altitude of* 483 *feet, giving a grade of* 173 *feet to the mile.* The barometer made the difference of level 15 feet greater. *I was surprised at this result, which taught that very erroneous impressions must generally be conceived with regard to differences of level if the eye alone is trusted to.*"

The use of the barometer will prevent the occurrence of any such errors, and it is probable that they are numerous. By it the level of one gap in a range of hills or chain of mountains can be compared with that of another, and thus the comparative ease or difficulty of connecting the contiguous plains or valleys by passing through one or the other, ascertained in the shortest possible time and with the least expense. If merely examined *par un coup d'œil* in the reconnoissance, experimental lines must be run through both gaps, and the two routes can only be compared, their relative merits and demerits ascertained, after a long, laborious, and expensive instrumental survey.

By using the barometer, the chief, after his reconnoissance, can say, with almost absolute certainty in any case, which terminus is above the other, which is the highest point along the route, which the lowest, and where the greatest difficulties are to be encountered. The barometer does not indeed give horizontal distances, but in determining the practicability of any proposed route *they* are of subordinate importance compared with differences of elevation. A pedestrian, a carriage, a locomotive, can accomplish horizontal distances with ease, but they cannot so easily ascend and descend hills and mountains. "These are the chief obstacles to the construction of roads and canals, and are the natural enemies of the engineer." By using the barometer he does not lessen their hostility to his improvements, but he discovers in the most expeditious manner where they are weakest, and where he can best attack and most easily overcome them. This is all that is claimed for the barometer as an engineering instrument; and it is enough. Its results are not so correct as those of the level. They are only approximations. It goes before, and, as it were, sketches out the work, gives the outline; the level follows after and completes the picture. But by means of the sketch which the barometer furnishes the level, the latter is enabled to accomplish its work in much less time, and at a vastly diminished expense. Up to the present time the barometer has been chiefly used by travelers in determining the approximate altitudes of mountains, by chemists in ascertaining the specific gravity of gases, and by mariners as a weather glass. Its utility as an engineering instrument has been recognised practically but by few, either in this country or in England; on the continent of Europe it has been (such is the writer's information) more extensively employed.

The recent "Pacific Railroad Surveys," instituted and carried out by the General Government, have been instrumental in calling the attention of engineers more particularly to the barometer, and have demonstrated beyond the shadow of a doubt, its great value as an engineering instrument, particularly where the reconnoissance extends over long lines, and where there are, any where along the line, considerable changes of level.

The reports of the surveys alluded to, and more particularly that of Lieut. Williamson, afford much valuable information on this subject. Lieut. W., as already quoted, states that the profiles "determined by the spirit level and barometer agreed remarkably well." This is important as bearing upon the relative accuracy of the level and barometer. It

will be well, however, to examine in some little detail the comparisons made between the level and barometer by Lieut. W. In the remarks already quoted, he states that the difference of elevation between two points as determined by the level is 483 feet; as determined by the barometer, 498 feet. *Assuming that the result given by the level is absolutely correct*, the error, in that particular case of the barometer, is 15 feet, or +·031056 of the whole, or —·030120 of its own determination. The result of this comparison is, that the barometric difference of altitude of two stations must be diminished by about three-hundredths of itself to get the true difference of altitude.

Denoting by H the true, and h the barometric difference of level of two places.

$$H = h\,(1 - \cdot 03012) = \cdot 96988\,h. \quad . \quad . \quad . \quad (1)$$

(1) is the result of a single comparison only, and of course cannot be relied upon unless it is confirmed by others. It is proposed to examine the other comparisons made by Lieut. W., and, rejecting only those which are obviously or probably incorrect, to determine the mean error of the barometer according to his observations. If the result thus ascertained is confirmed by other and more extended observations and comparisons, it can be relied on with more confidence.

TABLE I.—*Tejon Ravine.*

Level. (1)	Altitudes. (2)	Barometer. (3)	Altitudes. (4)	Differences. (5)	Per cent. (6)
— 2·1	2333·0	. . .	2327·3	5·7	·002449
— 39·0	2294·0	1·4	2328·7	—34·7	—·014901
—164·2	2129·8	—127·5	2201·2	—71·4	—·032433
—392·8	1737·0	—401·3	1799·9	—62 9	—·034947
—352·6	1384·4	—411·1	1388·8	— 4·4	—·003168
—226 5	1157·9	—249·7	1139·1	18 8	·016504
—218·7	939·2	—224·4	914·7	24·5	·026784
—170·3	768·9	—180·6	734·1	34·8	·047405
—243·1	525·8	—270·9	463·2	62 6	·135146
—136·2	662·0	148·3	611·5	50·5	·082583
—173·1	488·9	—116·6	491·9	— 6·0	—·012124

Explanation of Table.—This table is taken from Appendix C. of Lieut. Williamson's Exploration. (See vol. v., "Explorations for a Railroad Route from the Mississippi River to the Pacific.")

Column (1) gives the level-altitude of each station above the preceding station; (2) the total level-altitude of each station above an assumed station; (3) the barometer-altitude of each station above the preceding one; (4) the total height of each station as determined by barometer above the assumed one; (5) the difference between the corresponding numbers in (4) and (1), obtained by subtracting the numbers in (4) from the corresponding ones in (1); (6) the per centage of the barometric error, and is obtained by dividing the numbers in (5) by the corresponding ones in (4).

The mean result of this comparison is, that the barometer-difference of altitude is too small by +·032597 of itself. Hence,

$$H = (1 + \cdot 032597)\,h = 1 \cdot 032597\,h. \quad . \quad . \quad (2)$$

Comparing this with (1), it is seen that the errors are just the opposite of each other. Combining (1) and (2) the mean result is,

$$H = 1{\cdot}0012385\ h, \quad . \quad . \quad . \quad . \quad . \quad (3)$$

TABLE II.—*Tejon Pass.*

Level. (1)	Alts. (2)	Barom. (3)	Alts. (4)	Differences. (5)	(6)	Level. (1)	Alts. (2)	Barom (3)	Alts. (4)	Differences. (5)	(6)
59·2	59·2	60·8	60·8	— 1·6	— 1·6	109·7	2405·7	125·2	2457·3	— 15·5	— 51·6
239·2	298·4	231·6	292·4	8·6	6·0	186·7	2592·4	191·4	2648·7	— 4·7	— 56·3
184·5	482·9	205·8	498·2	—21·3	—15·3	202·3	2794·7	122·5	2771·2	79·8	23·5
217·4	700·3	228·6	726·8	—11·2	—26·5	353·4	3148·1	348·1	3119·3	5·3	28·8
217·4	708·3	216·7	714·8	0·7	—14·6	689·7	3837·8	797·7	3917·0	—108·0	— 79·2
165·2	865·5	202·3	917·2	—37·1	—51·7	—588·9	3248·9	—600·1	3316·0	11·2	— 67·1
77·9	943·4	39·1	956·3	38·8	—12·9	—147·6	3101·3	—121·7	3195·2	— 25·9	— 93·9
382·2	1325·6	408·9	1365·2	—26·7	—39·6	- -	- -	— 68·3	3126·9	- -	- -
182·1	1507·7	188·9	1554·1	— 6·8	—46·4	— 93·1	3008·2	— 88·5	3038·4	— 4·6	— 30·2
- -	1471·8	- -	1474·9	- -	— 3·1	—290·4	2717·8	—220·1	2809·3	— 70·3	— 91·5
- -	1471·8	- -	1439·6	- -	32·2	— 56·9	2660·9	— 24·7	2784·6	— 32·2	—123·7
- -	1471·8	- -	1411·3	- -	60·5	—104·1	2556·8	—110·2	2674·4	6·1	—117·6
- -	1471·8	- -	1487·4	- -	—15·6	—228·0	2328·8	—234·2	2440·2	6·2	—111·4
182·1	1507·7	- -	1527·0	- -	—19·3	—120·1	2208·7	—135·6	2304·6	15·5	— 95·9
106·5	1614·2	- -	1644·0	- -	—29·8	—112·0	2096·7	—121·1	2183·5	9·1	— 86·8
104·1	1718·3	82·7	1726·7	21·4	— 8·4	— 95·3	2001·4	— 69·0	2114·5	— 26·3	—113·1
577·7	2296·0	605·4	2332·1	—27·7	—36·1	— 60·6	1940·8	— 78·1	2036·4	17·5	— 95·6

Columns (1), (2), (3), (4), and (6) are copied from the table in the "Report." Column (6) is obtained by subtracting the numbers in (4) from the corresponding ones in (2); (5) by subtracting the numbers in (3) from the corresponding ones in (1).

The mean result is, that the barometer-altitude must be diminished by ·020999 of itself.

$$H = (1 - {\cdot}020999)\ h. = {\cdot}979001\ h. \quad . \quad . \quad (4)$$

Combining (4) with (3),

$$H = {\cdot}990170\ h.$$

TABLE III.—*Cañada de los Uvas.*

Level. (1)	Alts. (2)	Barom. (3)	Alts. (4)	Differences. (5)	(6)	Level. (1)	Alts. (2)	Barom. (3)	Alts. (4)	Differences. (5)	(6)
319·8	193·4	- -	213·4	- -	—20·0	246·1	2618·6	235·5	2673·8	—10·6	—55·2
190·9	384·3	190·3	403·7	0·6	—19·4	190·9	2809·5	194·9	2868·7	— 4·0	—59·2
339·1	720·4	325·7	729·4	10·4	— 9·0	— 51·5	2758·0	— 74·7	2794·0	23·2	—36·0
197·3	917·7	200·1	920·5	— 2·8	— 2·8	—322·8	2435·2	—333·1	2460·9	10·3	—25·7
138·0	1055·8	152·0	1081·5	—14·0	—25·7	— 55·0	2380·2	—146·5	2314·4	91·5	—34·2
102·8	1158·6	- -	1205·3	- -	—46·7	—148·8	2131·4	—170·0	2144·4	21·2	—13·0
102·2	1260·8	65·7	1271·0	36·5	—10·2	— 63·0	2068·4	— 71·9	2072·5	8·9	— 4·1
126·2	1387·0	145·2	1416·2	—19·0	—29·2	—103·6	2172·0	117·7	2190·2	—14·1	—18·2
79·6	1466·6	65·8	1482·0	13·8	—15·4	—169·3	2002·7	—152·9	2037·3	—16·4	—34·6
161·4	1628·0	140·0	1622·0	21·4	6·0	— 93·0	1909·7	—100·5	1936·8	7·5	—27·1
146·4	1774·4	147·6	1769·6	— 1·2	4·8	4·7	1914·4	30·8	1967·6	—26·1	—53·2
3·3	1809·7	38·9	1808·5	— 3·6	1·2	39·7	1874·7	55·1	1912·5	—15·4	—37·8
64·3	1874·0	52·6	1861·1	11·7	12·9	47·6	1922·3	71·0	1983·5	—23·4	—61·2
57·1	1931·1	68·5	1929·6	—11·1	1·5	— 52·7	1869·6	— 49·7	1933·8	— 3·0	—64·2
36·6	1967·7	41·4	1971·0	— 4·8	— 3·3	— 51·9	1817·7	—108·6	1825·2	56·7	— 7·5
77·3	2045·0	58·0	2029·0	19·3	16·0	— 67·3	1750·0	— 5·5	1772·7	—14·8	—22·3
61·1	2160·0	106·2	2135·2	—45·1	24·8	— 71·9	1678·5	—133·5	1639·2	61·6	39·3
266·4	2372·5	303·1	2438·3	—36·7	—65·8						

The columns in Table III are the same as in II. The per centage is determined as before, by dividing the numbers in column (6) by the corresponding ones in (4). The mean result is —·006898. Hence,

$$H = (1 - {\cdot}006898)\ h = {\cdot}993102\ h, \quad . \quad . \quad (6)$$

Combining with (5),

$$H = {\cdot}9916365\ h, \quad . \quad . \quad . \quad . \quad . \quad (7)$$

In the body of the report, pages 23 and 24, are recorded two other observations, which give as a mean result +·019331. Therefore,

$$H = (1 + \cdot 019331)\, h. = 1 \cdot 019331\, h, \quad . \quad . \quad (8)$$

Combining with (7),

$$H = 1 \cdot 00598375\, h, \quad . \quad . \quad . \quad . \quad (9)$$

With regard to the three observations taken from the body of the "Report," pages 23 and 24, viz :—

Level 483.	Barometer 498.	Difference	—15.	Per cent,	—·030120
" 2665.	" 2621.	"	+44.	"	+·016787
" 1308.	" 1280.	"	+28.	"	+·021875

It is proper to remark, that they do not appear in the tables extracted from the Appendix, and consequently they enter the calculations only once, as they should.

Formula (9) is the final result deduced from the observations of Lieut. W. It shows that the barometer-altitude is too small by ·00598375 of itself. For differences of level less than one thousand feet it will be almost inappreciable.

If (9) be combined with the result obtained from the reputed measurements of Black Mountain in North Carolina, the error will be diminished a little.

The following determinations of the height of that mountain have been going the rounds of the newspapers, and are presumed to be correct.

Barometer	6708 feet.	Prof. Mitchell,	1855.
"	6709 "	" Guzot,	1856.
Level	6711 "	Major Turner,	1857.

(Mean of barometers 6708·5); difference +2·5; ℅ cent. +·000372.

$$H = 1 \cdot 000372\, h, \quad . \quad . \quad . \quad . \quad . \quad (10)$$

Combining with (9),

$$H = 1 \cdot 003178\, h, \quad . \quad . \quad . \quad . \quad . \quad (11)$$

If the above reputed measurements of the altitude of Black Mountain are the ones determined by the gentlemen whose names are attached to them, formula (10) is valuable.

The results are remarkable, and, as bearing upon the relative accuracy of level and barometer important. The altitude of the mountain was determined by means of the barometer at two different times, by two different observers, and, probably, with two different instruments. The results differ by *one foot*. The third determination was made by means of the Y-level, by a third observer, and at a different time. It exceeds the loss of the previous determinations by *three feet*, the greater by *two feet*, and their mean by *two and a half feet*. The names of the observers are a sufficient guarantee that every precaution was taken to insure the greatest possible accuracy.

A few such independent determinations of the altitude of the same point are of more value, perhaps, than a number of isolated observations made to determine the altitudes of different points by the same indi-

vidual with the same instrument. And if scientific men, who have opportunity, will only multiply the observations with regard to the height of Black Mountain, the question with regard to the relative accuracy of level and barometer will be set at rest, at least for such high altitudes.

The Report of Lieut. W. does not state what means were taken to secure the greatest accuracy, though it is presumed that every precaution was adopted. The survey appears to have been conducted thus: The party divided; one portion remained in camp and made hourly observations with the barometer; the other ran a line of levels along the route to be surveyed and made hourly observations with the barometer also; the heights of those stations at which the leveling party made barometer observations, as determined by the level and barometer, were then referred to the station in camp. The three tables extracted from the Report, give the results of the three lines run to test the relative accuracy of the two instruments. The observations made with the barometer in camp and along the route were noted at the same instant, and thus the party carried out the instructions of Biot on that subject.

An examination of the tables will show that the difference between columns (2) and (4) are relatively much less than the differences between (1) and (3). By comparing columns (1) and (3), which give the level and barometer-altitudes of the stations with respect to each other, the final error of the barometer is +·003252. Hence,

$$H = 1{\cdot}003252\ h, \quad . \quad . \quad . \quad . \quad . \quad (12)$$

(12) agrees very well with (11). If their mean be taken,

$$H = 1{\cdot}003215\ h, \quad . \quad . \quad . \quad . \quad . \quad (13)$$

Between formulas (9), (10), (11), (12), and (13) there is but little difference, and none practically, unless h be considerable.

(To be Continued.)

For the Journal of the Franklin Institute.

Submerging of the Atlantic Cable.

The successful laying of the Atlantic cable, which has recently been celebrated throughout the country, is a work that must revolutionize much of the intercourse that annually takes place between Europe and this country; but, whatever may be its results in this respect, or whether it may in time become useless for the purposes intended, the skill and ability that has been developed in constructing the paying-out apparatus will not be lost; and we have reason to be proud, that to a member of the Franklin Institute,

WILLIAM E. EVERETT, Esq.,

Chief Engineer of the United States Navy,

belongs the honor of designing the machines used on board the *Agamemnon* and *Niagara*. The machines were constructed and erected on board each vessel, under his immediate direction and supervision, and

the paying out on the *Niagara* confided entirely to him. Mr. Everett's connexion with the enterprise may be stated as follows: In 1857 he was the Chief Engineer of the *Niagara*, and ordered by the Navy Department to assist in the operations of that year. On the arrival of the ship in the Thames, an examination was made, and it was decided that the *Niagara* did not possess sufficient capacity for the intended duty. This decision was made by the engineers of the company, and a merchant steamer had been selected to take her place. This decision caused great disappointment to every officer on board, and it was at this moment that Mr. Everett stepped forward and informed Captain Hudson that, if he would give his permission, he would make drawings of the ship, and demonstrate that she had the required capacity. Captain H. gave his assent; the plans were made; the capacity proved; the *Niagara* accepted, and the merchant steamer dismissed. During the operations of 1857, Mr. E.'s duties were simply those of engineer of the *Niagara*, and he had no connexion with the operations of laying the cable. After the return of the ships to England, having failed in the enterprise, a meeting of the company was held, at which the captains of the vessels, the engineers of the company, and Mr. Everett were present by invitation. It was unanimously decided that the paying-out apparatus was imperfect, and *must* be completely modified before success could be hoped for. Mr. E. advised that the advice of eminent engineers in England be taken, and he was authorized by them to consult such as he wished, and he called on Mr. John Penn, and through Mr. Penn's introduction, on Mr. Joshua Field, of the firm of Maudsley, Son & Field, and Mr. Lloyd, Engineer in Chief of the Royal Navy. These gentlemen took great interest in the matter, and visited the *Niagara* at Plymouth, to examine the defective machine, and subsequently returned to London, where it was understood Mr. E. was to meet them. Meanwhile he prepared a drawing of a machine having two sheeves, instead of four, as in the old machine. At the subsequent meeting of these gentlemen the majority did not think the four sheeves objectionable, and Mr. E. yielded to their judgment, and their joint report recommends several changes in the old machines. The introduction of Appold's brake, and an arrangement by means of a moveable sheeve and India rubber springs, by which, in case of extra strain, forty feet of additional cable might be paid out. At this point Mr. E. supposed his connexion with the company had ceased, and was much surprised a few weeks after to receive a letter from them, informing him that they wished his services in the construction of the new paying-out machines, and had made application to the Secretary of the Navy for that purpose. This permission was subsequently granted, and Mr. E. returned to England in January last, when the whole duty of designing and directing the construction of the new machines was confided entirely to him. The first five weeks after his arrival was consumed in erecting the old machines, two steam engines and four boilers, for the purpose of experiment. The month of March was consumed in experimenting on Appold's brake, before any satisfactory results were obtained; the difficulty being, that when running with any given

strain, say 2000 lbs., if the machine was stopped the clinging of the brake blocks to the drum was so great, that to put the machine in motion would require 100 ℘ cent. increased strain, say 4000 lbs. This would have been fatal to the success of any machine; and fortunately it was obviated at the last moment, by cutting the surface of the brake blocks into sections of one and a-half inch square. It must be understood that Appold's brake was a patent machine used in England, and that Mr. E. only adapted it to this particular duty. From all these experiments, he became convinced that a machine with two sheeves would be superior to one with four, and he immediately commenced the construction of the first machine, which, as soon as completed, worked to his entire satisfaction. The directors of the company invited most of the prominent engineers of London to examine it, and suggest any change that they might think would be of advantage; not one suggestion was made. In addition to this, Messrs. Penn, Field, and Lloyd, addressed a letter to Mr. Cyrus W. Field, stating that they had fully examined it, and had not any alterations to suggest, as everything appeared well adapted to the intended purpose. This letter does those gentlemen great credit; for as the machine differed materially from that recommended by them, and did not use the movable sheeve controlled by India rubber springs, it shows them to have been above every selfish feeling, in cheerfully endorsing Mr. Everett's apparatus. At this time Mr. E. received the following letter from the Secretary of the Company:

"ATLANTIC TELEGRAPH COMPANY,
"22 *Old Broad Street, London, April* 24, 1858.

"DEAR SIR,—As you have reported to the Managing Committee that the paying-out machinery for H. M. ship *Agamemnon* is completed, and that it has been working satisfactorily during the last three days, and that you do not consider any alteration necessary to increase its efficiency; and as another set is required for the United States Frigate *Niagara*, the Managing Committee have authorized and instructed me to request that you will immediately give directions to put another set in hand for that ship; and I am further to request that you will continue your supervision over the construction of the machinery, and also undertake to superintend and direct its being properly fixed and fitted on board the *Niagara*.

"I am further instructed to request, that you will take charge of the operation of experimenting upon, and subsequently of paying out, the cable from the ship; in doing which, you will have the co-operation of Messrs. Woodhouse and Follansbee, and of such other engineers as you may consider it requisite to appropriate to such service. You are also authorized to make such preparations and arrangements as are necessary to enable you to carry out the foregoing instructions.

"I remain, yours, truly, GEORGE SAWARD, *Secretary.*

"TO W. E. EVERETT."

After this his duties were very clear; the first machine was erected on the *Agamemnon*, and a second one constructed and erected on the *Niagara*. The organization of the corps immediately engaged in paying out the cable was as follows: Mr. Everett, assisted by Mr. Woodhouse, took alternate watches in the general supervision and direction of everything pertaining to the cable, and the process of paying out. Chief Engineer, Follansbee, and Second Assistant Engineer, Kellogg, kept alternate watches at the paying out machine, assisted by Mr. Gooderich and Mr. Hudson, who attended the dynamometer. In addi-

tion to the above, there was an officer always in charge at the coil, where were two wire-men as leading men, two splicers, and one gutta percha jointer. Sixty of the crew of the *Niagara* were permitted by Captain Hudson to enter the employ of the Company. These Mr. E. divided into two watches; fifteen were placed in the coil to assist the wire-men; five were placed near the machinery to clear away the tar, and the remainder along the line of the cable, from the coil to the stern-wheel.

From the coil to the engine-room was a speaking tube, through which were passed *all* orders controlling the speed of the ship, which it was necessary to vary continually.

It will be seen, that the submerging of the cable and the navigation of the ship were two distinct operations, in charge of different persons. Had the cable broken from any defect in the paying-out apparatus, no one could have blamed Captain Hudson. In conclusion, I would state that Mr. E.'s machines differ from any before constructed for that purpose; that the builders required his signature to every drawing, before putting it in hands; and that while he is specially indebted to Mr. Penn for his advice, and the friendly interest taken in his success, and also to Messrs. Field, Lloyd, Appold and Amos, for their aid and assistance, he is to all intents the designer of the paying-out apparatus, and, be it good or bad, it is his. To his companion and friend, Mr. Woodhouse, who took alternate watches with him during the process of submerging the cable, Mr. E. must ever feel much indebted.

—

Description of Machine.—The machine is placed at the after part of the vessel, a little on the starboard side, so as to be clear of the masts. The cable as it comes up from the hold, passes through a groove, and over a grooved wheel, and from thence on to the drums, of which there are two; each of these drums has four deep grooves in it, and the cable after winding round them four times, passes on from the last groove over a guiding wheel to a second machine, placed half-way between the first and the stern of the vessel. This second machine is for the purpose of indicating and regulating the amount of tension on the cable, so as to prevent it from running over the stern too fast, and at the same time not to allow the resistance to become so great as to endanger its breaking. The engineer applies the amount of weight he thinks necessary to accomplish the desired object; this weight is on a sliding frame, through which passes a rod; the lower end of this rod is attached to a piston, which works loosely in a cylinder of water, and the upper end is secured to a grooved wheel, under which the cable passes on its way to the stern; the cable thus sustaining the weight that has been applied on the sliding-frame. The piston below working in the water cylinder, is for the purpose of preventing sudden changes; for as the weight rises or falls, the water in the cylinder must pass around the piston, either above or below it. On the frame of the sliding weight is an index which gives the exact strain on the cable. Forming a part of this second machine is a wheel like

the steering wheel of a ship, with a drum attached to it; from this drum a chain passes back to the first machine, and connected to the levers of four powerful brakes; these brakes operate on four smooth wheels or pulleys by means of clamps, which are made to adhere in a greater or less degree, as more or less tension is wanted on the cable. Each one of these brakes has sliding weights applied to its lever, which may be slipped on or off, at the engineer's pleasure, and they also have pistons working in cylinders of water to prevent sudden action. In addition, each brake has Appold's self-acting apparatus for keeping the strain uniform. With these several arrangements, we will suppose the vessel in motion, and the cable passing through the two machines, and over the stern. A man is stationed at the wheel, with his eye on the index. As the ship rolls and pitches, she records the increased or reduced tension on the cable, and the man at the wheel tightens or slacks off on the brakes, thus keeping the strain almost perfectly uniform. To prevent the friction brakes from heating, the pulleys on which they operate work in tanks of water. The success of the machine may be inferred from its paying out the cable on the *Niagara*, without stopping once. FRANKLIN.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED FROM AUGUST 3 TO AUGUST 31, 1858, (INCLUSIVE,) WITH EXEMPLIFICATIONS.

AUGUST 3.

1. CULTIVATORS; William Adams, Detroit, Michigan.

Claim—The arrangement of the loop at the juncture of the cross and side bars, in combination with the binding pin and the double looped yoke extending transversely from one side bar to the other, for holding the handles.

2. GOVERNOR FOR STEAM ENGINES; Alban Anderson, Lancaster, Ohio.

Claim—The combination of machinery and the production thereby, or by its equivalent, of the resultant force defined, and the application of such resultant force to the regulation of the movement of machines or engines.

3. WHEAT SEPARATORS; W. H. Angel and M. Coffeen, Watertown, New York.

Claim—1st, The arrangement of the three perforated plates, having holes of the same diameter or area, and placed at the same inclination with the fourth perforated plate, having holes of a less diameter or area than the other plates, and at a greater inclination. 2d, The spring bar or rod and yoke, in connexion with the plates and bars at the other end of the plate box, for giving to the plate box the compound motion.

4. KNIFE SHARPENER; John J. and Austin T. Armstrong, Brooklyn, New York.

Claim—The combination and arrangement of parts described, that is to say, securing the file by its edges between the inclines, by which the advantages stated are secured.

5. STEAM ENGINES; Henry and F. J. L. Blandy, Zanesville, Ohio.

Claim—The application to portable steam engines of a hollow continuous bed plate, for the support and attachment of the operative parts of the engine, whereby the latter in working is rendered independent of the contraction and expansion of the former, and the boiler relieved from the direct strain of the engine.

6. METHOD OF REMOVING SUBMARINE DEPOSITS; Eli Brazelton, St. Louis, Missouri.

Claim—Removing sand, mud, or gravel from within sunken wrecks, or from submerged articles, with a view of raising the same, by means of a current of water forced by any proper means through a tube or spout, by which the current is directed and made to act at the desired spots.

7. SUBSTITUTE FOR THE CRANK; Aaron Brooks, Crawford County, Indiana.

Claim—A perpendicular pitman and the dispensing with a crank by means of the wheel attached to the shaft, and the slide or rollers attached to the pitman, and moving in the groove, the said pitman always moving perpendicular.

8. FLOURING MILLS; Robert J. Brown, Perry, Pennsylvania.

Claim—1st, The combination of cups without backs, with a perforated strap, for the purpose of elevating and discharging meal. 2d, The combination of a ribbed pulley with a conveyor on the bolting shaft. 3d, The arrangement of two, three, or more bolts within and concentric with each other, and upon the same reel shaft.

9. Grain and Grass Harvesters; Robert Bryson, Schenectady, New York.

Claim—Placing the cam in front of the driving-wheel, and operating therefrom by means of the double crank and the rods, when these several parts are constructed and arranged relatively with respect to each other and to the bar, in the manner set forth.

10. Metallic Fence; William Bush, Harrisburgh, Pennsylvania.

Claim—The construction of the base rail with a continuous dovetail groove, into which are slipped the panels with a corresponding tenon, and the top rail with continuous groove fitting on the top of the panels.

11. Converting Reciprocating into Rotary Motion; Isaac Chapman, City of New York.

Claim—The ratchet wheel or wheels, in combination with the pawls, arranged and operated by means of a parallel motion. Also, the manner of throwing the pawls in and out of gear with the ratchet, while the power is in motion, by means of the levers and the parallel spring slide.

12. Apparatus for Making Coffee; John Denley and Thomas H. Heberling, Warsaw, Illinois.

We do not claim the process of scalding coffee and boiling it afterwards by additional heat, or forcing water through ground coffee resting in a strainer. Nor do we claim the application of a heater to a vessel containing coffee.

Claim—1st, The apparatus for the forcible expulsion of the water through the bed of the coffee, resting on the strainer in the mouth of the inverted vessel by the pressure of steam in the upper part thereof, produced when the red-hot heater is inserted in the central tube. 2d, The cup for retaining a part of the water around the foot of the heater tube and the tin arch, for the purpose of preventing the joint at the end of the heater tube from becoming unsoldered when the rest of the water is driven from the interior of the vessel.

13. Railroad Frog; James M. Dick, Buffalo, New York.

Claim—1st, The construction of the chairs and arrangement of the parts of the frog upon them, in the manner by which I am enabled to remove any part of the frog without disturbing the other parts. 2d, The combination of the underhanging jaw upon the rail, E, with the rebated chair. 3d, Arranging the frog upon chairs in such a manner as to leave open space below the rails at the point where the rail, E, comes up to the rail, B and C.

14. Cop Tubes for Shuttles; James Eaton, Townsend Harbor, Massachusetts.

I do not claim the use of a cop tube of entire length of the spindle, when used alone and unconnected with the button, or its equivalent, to guide the yarn over the point of the spindle.

Claim—1st, The employment of a button upon the end of the spindle or of the cop tube. 2d, In combination with the above, I claim a cop tube of a length sufficient to hold the entire cop. 3d, A removable spindle in combination with the button and long cop tube operating in the manner set forth.

15. Lamps; William Fulton, Cranberry, New Jersey.

Claim—The register formed of the perforations in the top, and the perforated plate placed within the top, in combination with the perforated or air-distributing plate.

16. Sleeping Car for Railroads; Charles L. Harrington, Buffalo, New York.

Claim—The single rods in relation to the berths or couches, Nos. 1 and 2, the said rods being without collars or projections, and attached at each end to the side of the car, in combination with the shifting seats with slotted arms, and reversible and convertible backs, the rail, and bed, with the partitions.

17. Tube for Conveying Sound; R. G. Hatfield, Mount Vernon, New York.

Claim—The mouth in combination with the reflector, the mouth and reflector being of paraboloidal or approximate form, and arranged relatively with each other, so as to operate substantially as set forth. Further, the plate placed in the elbow, as described, and also the combination of the mouth, reflector, and plate, when arranged to act conjointly, as described.

18. Apparatus for Condensing and Purifying Gas; August Hendricks, Assignor to Victoria Hendricks, City of New York.

Claim—1st, A gas condenser which has the junction between its upper and lower chambers, accomplished by means of a water channel formed round the upper edge of the lower chamber, and a flanch formed round the bottom of the upper chamber, in combination with stationary rods, which sustain the upper section and adjusting suspension screws, or their equivalents, weights, cords, and pulleys. 2d, The specified arrangement of condenser and purifier on the same level and within the same chamber.

19. Field Fence; David M. Heikes, Franklin Township, York County, Pennsylvania.

Claim—The construction of the fence into separate panels by framing the posts, uprights, and rails together by means of beveled tenons and mortises, and the application of the circular braces, by the application of which the fence can readily be raised or lowered at one end from a horizontal to any angular position, and the posts and uprights will in every case stand perpendicular to the ground.

20. Field Fence; Cornelius Horton, Phelps, New York.

Claim—The combination of the staple with the two panels, the braces, and the key or pin.

21. Gas Stoves; Moses W. Kidder, Lowell, Massachusetts.

Claim—The condensing chamber with its trap and pipe, in combination with a combustion chamber.

22. Gas Burners; Frederick C. Krause, City of New York.

I do not claim to be the first inventor of a porous gas burner, as I am aware that they have been constructed of wire gauze, and by making beds of such material covered with broken pumice stone, and of some other substance. But I

Claim—The manufacture of gas burners, or those parts of them from which the gas is to be emitted, of the porous composition produced by the union of the substances specified, in the manner set forth.

23. Mode of Separating Fibre; Azel Storrs Lyman, City of New York.

Claim—The mode of separating the fibres of wood, flax, or other fibrous substances, for paper, cloth, or other purposes, by charging the mass with hot water, steam, compressed air, or other elastic fluid, while in a cylinder or other suitable receptacle, and then causing it to be projected from said receptacle into the atmosphere, or any space where it is subjected to a sufficiently less pressure to cause its disruption by the sudden expansion of the fluid within it.

24. Preserve Cans; Emmons Manley, Marion, New York.

Claim—The combination of the depression around the mouth of the can, and the cup-formed stopper, constructed and operating substantially as described.

25. Mode of Operating Presses; David L. Miller, Madison, New Jersey.

Claim—The application of two distinct actions by means of the bevel gearing, endless screw gear, barrel, and cylindrical nut, arranged as described.

26. Printing Presses; Frederick B. Nichols, Morrisania, New York.

Claim—1st, The employment of the polished metallic roller, arranged immediately in front of the inking roller, and made adjustable by set-screws, so as to enable its smooth periphery to be pressed against the periphery of the printing cylinder on a line parallel with the axis of both, and with such force as to prevent any ink on the engraved surface of the printing cylinder from passing between the two, and thereby removing the excess of ink from the smooth portions of the electrotype or thin plate, and causing the same to descend over the rising side of the said polished roller into the ink trough. 2d, Arranging the rollers and endless band over the same, in front of, and in such relation to the periphery of the printing cylinder, as to cause the descending portion of the endless band to extend from the same, tangential to a circle smaller than it in diameter, and to bear upon a portion of the periphery with an equal degree of tension over every part which it touches, and giving to the said part of the endless band a zigzag movement by means of the zigzag grooved drum and lug or arm.

27. Safety Whiffle-tree; George F. Oulten, Norfolk Co., Virginia.

Claim—The hooks constructed with two different angles, and which allow the traces to commence detaching as soon as they commence revolving, and are released entirely at one-fourth of a revolution.

28. Money Table; Wm. Painter, Wilmington, Delaware.

Claim—The combination of the dish or seat with its levers and slotted guide, seated and arranged as set forth, composed of wood or of a metallic substance, or composed of both wood and metal, for the purpose of a money-changer or money-receiver; not limiting myself to the exact form of the dish or seat, so that the construction is substantially the same as to guide the money without any possibility of its falling elsewhere than into the palm of the hand.

29. Hubs for Carriage Wheels; Norman Platt, Jackson, Mississippi.

Claim—The combination of a flanched metallic hub for carriage, wagon, and buggy wheels, with clips to stay and strengthen the spokes, together with a metallic boxing for said hub, secured by a swelled head screw and tap.

30. Stoves; Andrew Ralston, West Middletown, Pennsylvania.

Claim—1st, The arrangement of the side chambers, the centre chamber, and the regulating valves of the fan on the collar of the stove, where the pipe is usually attached. 2d, The arrangement of the curved bearing, the opening, the cam ratchet, the ratchet pawl, the damper with its three journals, and the division plate, as described. 3d, The arrangement of the plates with their division pieces, and the openings, and the large openings for the cooking vessels, as described.

31. Combined Broiling Furnace and Cooking Range; Wm. Resor, Cincinnati, Ohio.

Claim—The arrangement of the grates, passages, and dampers, or their equivalents, to temporarily connect the charcoal grate with the main fire, so as to ignite its contents, and afterwards disconnect them so as to burn independently.

32. Brakes for Railroad Cars; John W. Rice, Springfield, Massachusetts.

Claim—1st, The nut and screw, and its arrangement, when used for braking railroad cars. 2d, The bar extending from one brake to the other, the double fulcrum lever, and the rods playing through and against the double fulcrum lever, and the arrangement of the chain and pulley, when used in combination with each other.

33. Ox Yokes; Joseph H. Riggs, Gloucester, Massachusetts.

Claim—The racks, arranged and operating in the manner substantially as set forth.

34. Chucks for Centering, &c.; Daniel N. Smith, Boston, Massachusetts.

Claim—The centering tool, consisting of the chuck operating in combination with the shafts.

35. Sewing Machines; E. Harry Smith, City of New York.

Claim—Forming the stitch by means of the detached looper specified, operating in combination with the needle, and passing entirely through the loop, in the manner described. Also, the spreader on the side of the looper, for the purposes specified. Also, the revolving and oscillating lever, when constructed and arranged to drive the looper.

36. Argand Gas Burners; Joseph E. Stanwood, Malden, Massachusetts.

Claim—The improved Argand burner, as made with its several supporting tubes of its annular chamber extended down within the lower or receiving chamber and around its entrance hole or passage, substantially in manner as described, and for the purpose of preventing noise or singing of the flame when the burner is in operation. Also, the combination and arrangement of the perforated partition, with the annular or upper chamber of the burner, and having its perforations or spaces between the same, disposed with respect to the mouths of the inlet tubes.

37. Apparatus for Purifying Gas; Andrew Walker, Claremont, New Hampshire.

Claim—The construction of the cover of the horizontal washer with teeth, as described.

38. Pegging Machines; Edgar M. Stevens, Boston, Massachusetts.

Claim—1st, A peg wood box or receptacle, s, which is vibrated or reciprocated so as to bring the peg wood upon the knife, for the purpose of splitting a peg from the peg wood, and which is so located and arranged as to present the peg to, or directly over the hole in the sole into which it is to be driven. But I do not claim, broadly, any moving peg wood box, which is arranged remotely from the awl hole, made in the sole, and there delivers the peg wood or pegs, which ultimately are fed to the awl hole into which they are to be driven. 2d, In combination with the vibrating or reciprocating peg wood box, s, a stop which is adjustable to the length of the peg wood, and is located in the mouth of s, near the peg tube in f, and within less distance of the plane of the edge face of the knife than the bigness of one peg, and whose function is to hold the peg wood against the action of the knife in splitting off the peg, and this I claim whether such stop forms a part of the cover of the peg wood box or is separate therefrom. 3d, I am aware that it is not new to use a feed instrument having a compound movement like that described for m, that, therefore, I disclaim. But I claim the mechanical means, or their equivalents, for producing said compound movement of m, the same consisting of the bell crank lever, u, hinged to m, and the friction block, w, which is arranged to slide in the slot in u, both u and

w being arranged to pivot upon x. 4th, The use of a spring (the spring on v), or its equivalent, in combination with a peg wood feeder, m, having a range of feed movement, when unobstructed, greater than the bigness of a peg, for the purpose of rendering the movement of the feeder, m, self-regulating.

39. CASE SHOE BRUSH; Charles D. Thum, Philadelphia, Pennsylvania.

Claim—The combination of the brushes and case, as shown, the same being made of suitable material, such as wood, metal, india rubber, or its equivalent, and of any desirable shape.

40. HARVESTERS; J. V. Trump, Somerville, New Jersey.

Claim—The combination of the knife guards with the press plate, the finger beam, and the reciprocating cutters, when these several parts are constructed and relatively arranged as described.

41. FIRE PLACES; Wm. R. Warden, Boston, Massachusetts.

Claim—The combination and arrangement of the ornamental metallic frame, D, and vertical slide, F, containing smoke-pipe opening within the fire place, in the manner described.

42. APPARATUS FOR PURIFYING GAS; John Waterhouse, Little Falls, New York.

Claim—Introducing the gas into the purifier underneath a table, or its equivalent, near the surface of the lime water, so that it (the gas) shall pass horizontally through the lime water a sufficient distance to effect its purification, before it can rise to the chamber above, as set forth, by which means I obviate much of the pressure heretofore encountered in lime water purifiers, and get a better yield at a great saving of retorts.

43. RAILROAD RAILS; M. J. Waldron, Dunkirk, New York.

Claim—1st, Placing the ends of the rails in a suitably constructed chair between two ties, both of the ties being used as a bearing or supporting surface to the chair. 2d, The bolt in the enlarged recess in the ends of the rails and the jaws or lapped part of the chairs as an arrangement of means for forming an elastic or spring joint for the ends of the rails.

44. LOOMS; Joseph Welch, Philadelphia, Pennsylvania.

Claim—Reducing the normal capacity of the pattern wheel, or its equivalent, so as to make it perform the functions described, substantially in the manner set forth.

45. SLEEPING CARS FOR RAILROADS; Eli Wheeler, Elmira, New York.

Claim—In connexion with a pair of car seats which are enclosed within a compartment, and placed at the proper distance apart, pivoting by fixed pivots the backs of said pair of seats at such points on the arms of the seat frame, and in such relation to each other, that by turning the backs over in opposite directions, in the path of a vertical circle, they will both be brought and made to lie horizontally or on a level with the cushions of the seats within the space existing between the two seats, and upon a supporting cleat, F, and thus form a comfortable sleeping couch entirely enclosed within the compartment.

46. SEWING MACHINES; Darius Wheeler and Luman Carpenter, Oswego, New York.

Claim—The combination of the notched looper with the needle spring pins and cam plate, whereby one end of the looper takes the loop and the other end discharges it upon the needle, while the looper is moving continuously in a circle. Also, the form of the looper, whereby as the looper progresses through the loop, the loop by the combined action of the needle and looper becomes shorter than when first taken, and is removed entirely out of the path of the point of the looper at and after its discharge, so that it cannot be taken again by the looper.

47. METHOD OF REGISTERING THE MOTION OF MACHINERY; S. Lloyd Wiegand, Philadelphia, Pennsylvania.

Claim—1st, Reversing the motion of the zones or indicating dials by friction applied to them in the manner set forth. 2d, The arrangement of the spring, I, to act as a detent in reversing.

48. SEED PLANTERS; James D. Willoughby, Carlisle, Pennsylvania.

Claim—The arrangement of the rollers placed horizontally with the slide, as constructed, for regulating the discharge of seed, and the frame for keeping said roller in place, and preventing the lateral discharge of seed.

49. STOVES; J. H. Wilkinson, Concord, New Hampshire.

Claim—1st, The arrangement of pipe, K, within pipe, E, and damper, L. 2d, Inserting the air chambers, J J, in the linings of the fire-pot. 3d, The holes, m m, in connexion with the bed plate, O, provided with the arch piece, S, or their equivalents.

50. MACHINE FOR MANUFACTURING SHOE PEGS; I. G. Worth, Vassalboro', Maine.

Claim—A combination and arrangement, essentially as specified, of a vibrating knife, or its equivalent, a bench or table, two fluted rollers, and mechanism for imparting to such rollers intermittent feeding motions, in opposite directions, the same being productive of advantage in cutting blocks into pegs.

51. ELECTRO-MAGNETIC ENGINE; Frederick Yeiser, Lexington, Kentucky.

Claim—The employment of a series of balanced beams with bars arranged and combined with the magnets, frame, and rod.

52. BUTTER WORKER; W. Bancroft, Assignor to self and H. M. Proctor, Burlington, Vermont.

Claim—The combination of the roller, P, with the roller, J, and share, O. Also, the combination of double geared shell pinion, D, with the basin, A, adjustable shaft, H, socket, E I, and pinion, G, so that by turning the screw, K, the shaft, H, may be raised or lowered, and the height of the roller, J, altered at pleasure.

53. MECHANICAL JACK; Amos Jones, Assignor to self and S. M. Davis, Lebanon, New Hampshire.

Claim—Constructing an improved jack by combining a double toothed shank with a suitable head-piece, when the teeth of said shank are arranged in such a manner as to furnish the necessary fulcrum and catches for the operating lever in the performance of its appropriate functions.

54. MACHINE FOR MAKING BEEF AND OTHER STEAKS TENDER; Thomas W. Moore, Assignor to Elliot & Moore, Plattsburg, New York.

Claim—The combination of joint, lever, and the jaws, when the devices are so arranged that the jaws operate in relation to each other, substantially as specified.

55. CENTRIFUGAL GUN; C. B. Thayer, Boston, Assignor to self and Charles Robinson, Cambridgeport, Mass.

Claim—The spiral groove, d, arranged as specified. In combination with the spiral groove, d, I also claim the space, g, and heel, h, at the extremity of each arm or aperture of the thrower.

AUGUST 10.

56. STRAW CUTTERS; Darius Babcock, Dryden, New York.

Claim—Operating the feed rollers through the medium of the levers, F F, rods, H H, connected with said levers by means of the sliding collars, pawls, and crank pulley.

57. MACHINE FOR THRESHING AND SEPARATING GRAIN; N. J. Becker and J. M. Harvey, Amsterdam, N. Y.

Claim—The combination of the swinging arm or arms, straw carrier brackets or projections, elbow lever, connecting by links the swinging arm to the separator, pitman, operated by crank pin from the fan shaft to drive the swinging arm, and fan, and threshing cylinder pulleys, and driven by the same band or belt, as set forth. We do not claim the combination of a reciprocating or independently moving perforated straw carrier with a stationary bed-plate, but as gearing the serrated bar frame to the perforated bed-plate and conducting board, that said latter portion shall give an accelerated motion to the bar frame simultaneously with, but in reverse directions to, the travel of the bed-plate; providing the feeding throat of the thresher, or thresher concave, with a dust spout or outlet above, and furnishing the cylinder race with a dust passage in front, under the feed table.

58. SEED PLANTERS; Addison Berdan, Macon, Michigan.

Claim—The arrangement of the reciprocating piece, adjustable tubes, stationary piece, and top plate, with hoppers.

59. HARROW; Addison Berdan, Macon, Michigan.

Claim—The combination of tooth bars having projections, with guide, oscillating lever, and frame, the whole being constructed, arranged, and operated as set forth.

60. MACHINES FOR ROLLING LEATHER INTO BALES; Nathan Burk, Fulton, New York.

Claim—In combination with the winding and clamping shafts, the spring table, with its friction roller, stops, and string guides.

61. WIND GUARD FOR CHIMNEYS; F. M. Butler, City of New York.

Claim—The arrangement of the pipe, radial guard, inner disk, and hood, when in substantially the proportions specified.

62. OPERATING THE TEETH OF CYLINDERS FOR BURRING WOOL, &c.; T. B. Butler, Norwalk, Connecticut.

Claim—The application of teeth to a rotating cylinder having an uniform peripherical surface, in such a manner as to be projected beyond the said surface to catch the fibrous materials to be operated upon, and afterwards retracted into pockets within the said peripherical surface, for the purpose of holding said material and presenting the greater portion of it upon the even peripherical surface of the cylinder without any obstruction to the action of strippers, brushes, or other analogous devices for burring, ginning, or cleaning it, operating in combination with said cylinder.

63. MACHINE FOR CHAMFERING AND CROZING BARRELS; A. H. Crozier and Cyrus Carrier, Oswego, New York.

Claim—The method described of moving the crozing and chamfering tools to and from their work, by means of the differential movement of the wheels, Q and S, produced in the manner described, when operating the cam or eccentric which controls the action of the tools.

64. METALLIC LATH SURFACE; John B. Cornell, City of New York.

Claim—The shape of the sheet metal sections, which enables them to securely retain coatings of plaster, when the said sections are secured to vertical supports, and which also enables said sections to be securely combined with partition studs without the aid of nails, screws, or bolts.

65. SAFETY GUARD FOR SAFE DOORS; John B. Cornell, City of New York.

Claim—Arranging a safety guard within the door of an iron safe, in such a manner with relation to the lock or locks, and the fastening bolts which are combined with said door, that the act of forcibly displacing the said lock or locks from its or their proper position on a locked door, will cause the said safety guard to be thrown into such a position that it will securely hold the said fastening bolts in an extended position from the moment that the lock bolts cease to exert a retaining action on the said fastening bolts.

66. APPLYING BRAKES TO HAND TRUCKS; C. L. Daboll, New London, Connecticut.

Claim—The application of the described devices to hand trucks, in the manner set forth.

67. APPARATUS FOR PURIFYING GAS; W. F. Danowsky, Allentown, Pennsylvania.

Claim—The use of the purifier, when arranged and combined with a gas trap, in the manner described.

68. TREATMENT OF CAOUTCHOUC; Austin G. Day, Seymour, Connecticut.

Claim—Running the heat for vulcanizing elastic hard rubber compounds, as set forth, through the several grades of temperature, and the several intervals of time described. Also, making the elastic hard rubber composition of two parts by weight of rubber, and one part of sulphur, when such composition is made preparatory to the running of the heat through the several grades of time and temperature. Also, equalizing the temperature in the heating apparatus by mechanical means or by a current of steam, or its equivalent.

69. BED BOTTOM; W. H. Elliott, Plattsburg, New York.

Claim—The combination and arrangement of braces, flexible strap, slats, and springs, whether the said braces reach from one outside slat to the other, or only to some of the intermediate slats, and whether said braces are attached to the upper or lower side of slats.

70. HINGES; W. H. Elliott, Plattsburg, New York.

Claim—Combining with the table hinge a portion of the rule joint, as specified.

71. HARVESTERS; M. E. Ellsworth, Hudson, Ohio.

Claim—The manner of attaching the seat to the gear plank by means of the rods, or their equivalents, having a pin or hinge point both upon the gear plank and foot-board, in combination with the rods, or their equivalents, which connect the foot-board directly with the reach-board.

72. APPARATUS FOR TANNING HIDES; L. C. England, Oswego, New York

Claim—Causing the liquors to circulate among hides, which are kept in fixed positions, for the purposes set forth.

73. SEED PLANTERS; H. C. Fairchild, Brooklyn, Pennsylvania.

Claim—The rotating or semi-rotating seed-box, provided with the cylindrical case, B, fitted within the case,

c, in connexion with the plunger connected with and operated by the movement of case, B, as shown, the plunger case attached to case, C, and the seed distributing device formed of the perforated bottoms of the cases, B C, and the cut-off.

74. CULTIVATORS; N. W. Fraser and A. J. McLellan, Laporte, Indiana.

Claim—The arrangement of the fender attached to the shovel standards, the shoves, and the wheels, on the vertical shafts, the whole being arranged for joint operation.

75. SEWING MACHINES; James E. A. Gibbs, Millpoint, Virginia.

Claim—So constructing and combining or arranging and operating a revolving hook or looper with a reciprocating needle, as that the one loop shall be taken from the needle after the former loop shall have been drawn up on, along, or over the needle during its advance movement, in the manner described. Also, the conical sleeve, or its equivalent, for holding the spool and for revolving therewith, in combination with the adjustable cones, or their equivalents, for producing the requisite degree of friction upon the conical sleeve spool-holder, when constructed so as to operate substantially in the manner set forth.

76. LOCOMOTIVE STEAM ENGINES; John C. Hagan, Nashville, Tennessee.

Claim—1st, Arranging the cylinder of a steam engine so that it is free to move at right angles to the motion of its piston rod, and in a plane parallel with the plane of motion of the cranks connected with the rod. 2d, In combination with the cylinder of a steam engine, arranged so that it is free to vibrate, I claim connecting each end of the piston rod with the crank of a driver, and giving motion to both drivers in the same direction, without the interposition of connecting links. 3d, Giving to the cylinder of a steam engine a positive reciprocating motion, by combining therewith a secondary engine, or any equivalent mechanical device, arranged so as to support and move the cylinder in a plane parallel with the plane of motion of the cranks connected with its piston rods, and in right angles to the line of motion of the piston rod. 4th, Supporting the main cylinder in the guides in which it vibrates by means of trunnions, arranged as described, so that the cylinder may accommodate itself to the axles of the drivers on an uneven track. 5th, Connecting the slide valves of the secondary engine with the quadrant block of the expansion gear of the main engine, by which means the motion and the changes in the valves of both engines are uniform and simultaneous. 6th, The combination of the slotted link, the cam block, the pump hand gear, or any mechanical equivalents, whereby not only can the length of stroke of the pump be varied during the motion of the engine, but also the pump may be worked while the engine is at rest. 7th, Combination of the sliding steam pipes with the main driving cylinder, arranged for the purpose of admitting steam to the cylinder.

77. CLOTHES RACK; A. A. Harris, Ravenna, Ohio.

Claim—The radial arms, so jointed or pivoted to hubs that they will be supported by the joints or attachments to the hub, the hubs being loose on the staff so as to revolve, and at equal distances apart, to form a series of horizontal and parallel frames, each of which series may be folded up separately and the whole be adjusted vertically by the main staff.

78. APPARATUS FOR HEATING AND COOLING AIR TO BE USED AS A MOTIVE POWER; W. Hidden and J. Reeves, City of New York.

Claim—Heating air in one section of a rotating or reciprocating cylinder, and at the same time condensing the exhausted air from the engine in another section of the same cylinder, and at intervals changing the condensing section into a heater, and the heating section to a condenser, by revolving or reciprocating the cylinder so as to alternately have the upper section occupy the place of the lower section in a tank of water, and the lower section to occupy the place of the upper one in proper relation to a furnace flue.

79. TELEGRAPHIC INSTRUMENTS; George B. Hicks, Cleveland, Ohio.

Claim—The described devices, or their equivalents, by means of which two armature levers, one of which is upon the receiving instrument, and the other upon the recording instrument, are moved simultaneously, as seen in figures 4 and 6, in order to render it impossible for any portion of the current from M 2 or N 2 to pass through the magnets, M M or N N, figures 2 and 5, except when required to change the position of lever, G, G′. Also, the described arrangement for so connecting a circuit through the armature levers of the receiving and recording (local) magnets, figures 4 and 6, that a current may be diverted through the magnets, M M or N N, figures 2 and 5, at the pleasure of a distant operator, and thereby changing the position of the lever, G G, figures 2 and 5, for the purpose of enabling the operators upon two distant circuits to transmit intelligence from one circuit to the other without the aid of an intermediate operator, by the means and in the manner specified. Also, the employment of the devices named, or their equivalents, whereby a current from the battery, S, may be diverted from one magnet, M M, to another, N N, as set forth, by means of the arm, I, (upon the lever, G G, figures 2 and 5,) striking upon Z Z′, as the lever, G G′, is depressed at X or X′.

80. SHIP'S WINDLASS; Peter H. Jackson, City of New York.

Claim—The bit taking the end of the shaft, when combined with the brace, block, and key, or their equivalents.

81. CABLE STOPPER; Peter H. Jackson, City of New York.

Claim—The combination of the cam lever or levers with the hinged pawl, in the manner specified.

82. HANGING WINDOW SASH; Ross Johnson, Frederick, Maryland.

Claim—Side boxes constructed on the face of the jamb, and arranged in front and at right angles to the face of the sash, in combination with narrow oblong weights, and with pulleys, arranged in a manner adapted for the use of side boxes and flat weights.

83. SEED PLANTERS; E. W. Kimball, Ottawa, Illinois.

Claim—The slide placed within the box or case perforated at D, and provided with the endless band and the seed cup attached, in connexion with the elastic or yielding plate and rest plate or guide, placed at the lower end of the box or case—it being understood that I do not claim separately any of the parts, but the whole combined, as set forth.

84. BATHING APPARATUS; Frederick Kraemer, Brooklyn, New York.

Claim—The tub, constructed of two semi-cylindrical portions connected together, as shown, in connexion with the steps, supply cocks, and discharge valves.

85. MACHINES FOR CLEANING WHEAT; Jesse Lantz and John Russell, Wheeling, Virginia.

Claim—1st, The additional air tube or arch, F, in connexion with the air tube or arch, E, for the purpose of receiving the wheat through an aperture in pipe, F, above the hopper, V, and from the hopper, O. 2d, The adjustable reeded rubber, O, combined with the flanch rubber, I.

86. ROCK DRILLS; Wm. Lewis, Harrisburgh, Pennsylvania.

Claim—1st, The combination of the peculiarly constructed lifting jaw, with the peculiarly constructed vibrating flexible frame and inclined planes, whether operated by a lever or other mechanical device. 2d, The peculiarly constructed vibrating flexible frame for holding the lifters together, and shifting them out of the way alternately. 3d, The united use of the lever and strap for operating on the lifting jaw, inclined plane for turning the bar, and flexible vibrating frame, for throwing the jaw out of gear with the drill bar.

87. MACHINE FOR CORING AND QUARTERING APPLES; Charles Lounsberry, Jr., Nichols, New York.

Claim—The combination and arrangement of the knife with the movable step, the standard with its attachment, the cup and spring being substantially made as described.

88. APPARATUS FOR GENERATING GAS; Henry Lyles, Washington City, D. C.

Claim—The peculiar arrangement of the perforated chamber as constructed with the retort, gauge cock, stop cock, and siphon pipe, when they are constructed in the manner specified.

89. RETORTS FOR DISTILLING OILS FROM COALS; John and W. B. McCue, Freeport, Pennsylvania.

Claim—1st, The employment of the connecting pipe located in the retort in other than a central position, whereby we are enabled to conduct off the oleaginous products of the coal, while the said retort partially revolves backward and forward on its axis. 2d, Providing the retort with the longitudinal ribs, for the purpose of agitating the coal and preventing its sliding when the retort turns.

90. MACHINES FOR FANNING AND ASSORTING GRAIN; R. Nutting, Randolph, Vermont.

Claim—1st, The arrangement of the screens for separating and assorting, when so combined with shoes, frames, and motive arrangement, that the grain, seeds, beans, &c., are required to pass over them in a sliding or rolling manner, and not caused or allowed to drop on their surface or fall thereupon vertically, or so as to strike an aperture endwise first. 2d, The hold-fast, substantially as described. 3d, The extra-screens box, substantially as described, in combination with the drawers. 4th, The percussion bar, substantially as described.

91. COUNTER SCALES; H. B. Osgood, New Haven, Connecticut.

Claim—The method of bringing the pea to standard weight, and to enable it to indicate weight from scales on opposite sides of the beam, consisting of the adjustable pins, in combination with the pea, as described.

92. ESCAPEMENT FOR TIME-KEEPERS; E. Paulus, Philadelphia, Pennsylvania.

Claim—The modification of the duplex escape wheel in compressing the upright row of cogs, the manner of giving the impulse directly by it with a pin jewel set in the main roller mounted on the balance axis: the detent with its fork, toothed for gearing with the pinion of the resting cylinder, and its particular arrangement on the escape wheel axis: the arrangement of the resting cylinder with its pinion; the particular disposition of the lifting roller acting in the fork; the new and more solid arrangement to hold the escapement without bridges, but with simple pillars supporting two small plates secured with pins or screws.

93. BAKE OVENS; Wm. Pettet, City of New York.

Claim—1st, The arrangement and construction of an oven with two furnaces, the one being located on the exterior and the other on the interior of the oven, each communicating with the same series of flues, so that either one may be used at pleasure, whereby the heat may be retained within the oven, or diffused through the apartment. 2d, So constructing the interior of the described oven and its flues, that the entire lining may be removed for the purpose of clearing the flues, and replaced.

94. PRINTING INK ROLLERS; Elisha Pratt, Salem, Massachusetts.

Claim—The employment of an alkali in the manufacture of inking rollers, in the manner set forth. Also, the use of rosin oil, rosin and shellac, in combination with the other materials employed, in the manner set forth.

95. REPEATING FIRE ARM; Franklin B. Prindle, New Haven, Connecticut.

Claim—The use of two charge tubes (one of which to contain the balls and the other the cartridges), in combination with the two chargers and ramrod, when constructed, arranged, and made to receive the charge and deposit it in the barrel simply by pulling the trigger. Also, the combination of the hammer and sectors with the chargers and ramrod (so that I may charge, cock, and fire by simply pulling the trigger), when the whole is constructed, arranged, and made to operate substantially as described.

96. HAY ELEVATORS; E. M. Rees, Norristown, Pennsylvania.

I do not desire to claim, broadly, the locking of the frame to, and releasing it from, an elevating rod, as such a device is described and claimed in the patent granted to T. T. Jarrett, May 30, 1854. Neither do I desire to claim, broadly, a spring latch for releasing and retaining the frame. But I

Claim—The plate with its spring bolt and rod, in combination with the forked rod, with its upper end bent, as described, and its projection, f, when the several parts are constructed and arranged with respect to each other and to the frame, substantially as set forth.

97. STEAM VALVE; George Rieseck, Pittsburgh, Pennsylvania.

Claim—1st, The valve, D, with a projecting hollow stem, E, which is reduced so that its end presents an area only equal, or nearly so, to the ports, F, F1, F2, G, G1, G2, in combination with a main steam chest or chamber, J, and an auxiliary steam chest or casting, I, furnished with a stuffing-box, d, and constructed so as to cover the whole of the back of the valve excepting the end of the stem or a portion of the back equal, or nearly equal, to the ports in its face. 2d, In combination with the above, the peculiar manner specified of making the face of the valve, D, with six ports, F, F1, F2, G, G1, G2, three for receiving and three for exhausting, said ports being arranged in such relation to each other, that when the valve is applied to an oscillating engine, one receiving port always stands in a line with an exhaust port, and that only four of the ports shall be in use when the engine is working forward, and the extra two thus kept in reserve, so that the engine may be reversed on shifting the valve by the pressure of steam from a full open port.

98. SEEDING MACHINES; T. R. Richmond, Massillon, Ohio.

Claim—The reciprocating slides, operated as shown, in combination with the caps and plates, the above parts being perforated and arranged as set forth.

99. HARROWS; Jeremiah Routh and Abel Vaughn, Grayville, Illinois.

Claim—The combination of the vertical toothed wheel, D, with the horizontal toothed wheels, B B, said wheels being connected by gearing, as described, by which we secure the necessary rotation, without either side draft or dip of the horizontal wheels.

100. PRINTING PRESSES; C. Edward Sneider, City of New York.

Claim—1st, The revolving double segment frame with segments balancing each other, in combination with a rocking type bed, operated through the segment frames. 2d, The rocking type frame with eccentric ways attached, working over fixed rollers in the manner described. 3d, The arrangement and the manner of operating the distributing cylinder, supported between the segment frames upon the shaft to which the segment frames are attached, said cylinder being made to revolve in the opposite direction to the motion of the shaft, and having at the same time a side motion communicated to the said cylinder for the purpose of distributing the ink upon the inking rollers, in connexion with an arrangement of inking rollers, operated in the manner specified. 4th, The arrangement and construction of the fly-motion, in the manner described, operating in connexion with the nipper.

101. STEAM VALVES; Wm. J. Stevens, City of New York.

Claim—The slotted lever, F, the T-shaped lever, G, and the spring, K, arranged in relation with each other and with the piston rod and the valve stem, to operate substantially as set forth.

102. MACHINES FOR POUNDING RICE; John Tallon, New Orleans, Louisiana.

Claim—The combination of the pounder, arms, cross-head, connecting rod, and crank, arranged to operate in relation to each other, as shown.

103. FOLDING GRIDIRON; Joseph H. Thomas, Newark, New Jersey.

Claim—The application to a folding gridiron of the hinge joint, formed by the slotted stands and the projecting bearings on the ends of the back cross-bar, or their equivalents; the jointed handle and slotted standards, or their equivalents.

104. CEMENT FOR ROOFING PURPOSES; Joseph Thompson, North Wrentham, Massachusetts.

Claim—The composition, substantially as described, consisting of an alkaline silicate, oil or oils, coal tar, or pitch of coal tar, and naphtha (water being added when necessary), such being for the purpose or purposes set forth.

105. BILLIARD CUSHIONS; Wm. K. Winant, Brooklyn, New York.

Claim—The strip of steel, or equivalent material, inserted into the crease or incision in the india rubber cushion, substantially as specified. Also, the metallic bearing bar, between the back of the india rubber and the cushion rail, substantially as set forth.

106. VARIABLE BORING BIT; Wm. Tucker, Gloucester, Rhode Island.

Claim—The combination of a tapering centre point or screw centre, and an auxiliary cutter arranged on the shank, as described, with a main cutter applied to the shank, so as to be capable of being revolved thereon, and fixed in position thereon, by means substantially explained.

107. REDUCING WOOD FIBRES TO PAPER PULP; Henry Voelter, Heidenheim, Wurtemburg, Germany; patented in Wurtemburg, August 29th, 1856.

Claim—1st, The particular arrangement, construction, and combination of the machinery, or the mechanical expedients employed, as herein specified, for reducing blocks of wood, or producing wood pulp, by feeding them up automatically to a rotating grind or mill-stone, in connexion with the peculiar manner of applying or locating said blocks upon the circumference of the stone, or on a portion of its circumference, by holding them behind each other, in a position and direction essentially the same as described. 2d, The employment and the combination of a series of perforated and rotating cylinders with the reducing expedient, when contracted and connected between themselves, in the manner herein specified, by surrounding troughs and communicating channels or reservoirs, all made to operate as set forth, and for the purpose of assorting the fibres when separated from the wood in the modes described, rendering the pulp fit to be formed into paper of different qualities.

108. SEEDING MACHINES; S. R. Weldron, Winnebago Station, Illinois.

Claim—Dividing the hopper into two equal compartments, and using a slide to graduate the opening, a, between them, when the hopper, thus arranged, is used in combination with the rotating seed distributing wheels, flap or back board, and the double walls.

109. BEE-HIVES; Thomas H. Windle, Wagontown, Pennsylvania.

Claim—1st, The combined arrangement in the moth trap of the tapering moth tubes and the ventilated bee escape tubes, when the same are used in combination with the hive. 2d, Making each of the larger bee apartments with the self-cleaning slide, the said slide being conducted as described, and applied in connexion with the tongued piece, so as to operate substantially in the manner described.

110. MACHINERY FOR FORMING BATS FOR FELTING; Thomas B. Butler, Assignor to Lounsberry, Bissell & Co., Norwalk, Connecticut.

Claim—The arrangement of rows of teeth upon the calendar or felting roll, to hold the sliver while the vibration of the roll is changed, and the angle formed. Also, the rods, springs, pins, and cams, or their equivalents, arranged and operating as described.

111. STEAM ENGINES; John J. G. Collins, Assignor to self, Wm. A. Rhodes and Thomas Drake, Philadelphia, Pennsylvania.

Without claiming, broadly, the superheating of steam prior to its admission to the cylinder of a steam engine, I

Claim—Combining together for joint action, a cooler, regenerator, and steam engine, when the said regenerator is constructed and operated substantially in the manner set forth, and when it is furnished with the devices specified, or any equivalent to the same, by means of which it receives a supply of steam from the coolers, retains until it is superheated, and delivers it to the engine, at intervals regulated by the movements of the latter.

112. BURNERS FOR VAPOR LAMPS; Frederick Heidrick, Assignor to C. F. Clothier, Philadelphia, Penna.

Claim—The employment of the self-adjusting washer in connexion with the burner, button, and wick tube, in the manner set forth.

113. PLOUGHS; Joseph Jones, Assignor to Edmund Jones and Joseph Jones, Jr., Wilmington, Delaware.

Claim—The combination of the described gear and levers, when constructed and arranged for operation conjointly in the manner set forth.

114. TANNING HIDES; Theodore Klemm, Pfullingen of Rentlingen, near Stuttgart, Wurtemburg, Germany, Assignor to Edmund Moss, London, England.

Claim—The process of treating and impregnating hides, skins, and other animal tissues, by alternately

agitating them in a heated atmosphere or current of heated air, and rubbing or smearing them with the substances specified.

115. GAS RETORTS; Alfred Marsh, Assignor to self, E. Hall Covell, J. Q. Dudley, and Robert Holmes, Detroit, Michigan.

Claim—In the construction of apparatus for the manufacturing of gas from resin or oils, the spiral column resting on feet with the flue through the centre; and also the apertures between the threads of the spiral column, in combination with the case, in the manner set forth.

116. CULTIVATORS; Robert Sawyer, Wales, Assignor to Wm. G. Brown, Monmouth, Maine.

Claim—My improved weeding and hilling plough, constructed substantially as described, viz: with a coulter, a root cutter, adjustable cutters, and turning shares, applied to adjustable handles and a plough beam.

117. COOKING STOVES; John L. Stewart, Assignor to Randolph A. Nathurst, Nashville, Tennessee.

Claim—In connexion with the sunken recesses the use of flues or passages, substantially as set forth.

118. FOLDING PAPER; John North, Middletown, Connecticut, Assignor to American Book and Paper Folding Co., Assignor to Anson Hardy, Assignor to Steuben T. Bacon, Boston, Massachusetts.

Claim—1st, Placing the sheet direct in register upon the knife to receive its first fold. 2d, Folding paper by means of a straight edge or knife and reciprocating rollers. 3d, Hanging the frame with reciprocating rollers and folding knife attached, to move and reciprocate in the arc of a circle. 4th, Causing the rollers to rotate and change their motion alternately. 5th, Cutting off the inset for the 12-mo folding, at the same time it is being folded.

119. PREPARING FRAMES FOR GILDING; James W. Campbell, City of New York.

Claim—The inclined lathe, in combination with the inclined tool, when said tool is arranged substantially as shown, so as to be rendered capable of being adjusted to the frame, D, by the treadle frame, G, and at the same time allowed a lateral movement or play, to conform to any irregular movement of the frame due to an imperfect centering of the same on the plate of the lathe.

AUGUST 17.

120. CORN SHELLERS; Calvin Adams, Pittsburgh, Pennsylvania.

Claim—The combination of the pairs of adjustable and yielding wheels with the pairs of shelling wheels, when constructed in the manner described. Also, the manner of connecting the shafts with their respective cog-wheels, by means of the pivots and conical hub, or their equivalents, so that whilst they may revolve together, the shafts may play back and forth to adapt the feeding wheels to the various sizes of the ears of corn to be shelled.

121. WASHING MACHINE; David Allan, St. Louis, Missouri.

Claim—The air chamber or concave top of dasher, or its equivalent.

122. CHURN; James S. Appleton, White River Junction, Vermont.

Claim—Securing the churning vessel within a freely swinging frame, when the dasher of the churn is operated by means of a crank shaft, pitman, and vibrating beam.

123. CROSS-CUT SAWING MACHINE; John T. Armstrong, Jacksontown, Ohio.

Claim—The combination of the frame, A, wheel, E, and guide rod, F, with the frame, C, and carriage, L, and saw, I, when arranged in relation to each other, and operated in the manner set forth.

124. RAILROAD CAR SEATS; James M. Baird, Wheeling, Virginia.

Claim—1st, The oscillating pedestal and the vertical lever stay, in combination with the stationary seat stand, and the arrangement of the slats in each, by which to adjust the seat to any position required with the wheel, and also the arrangement by which the backs are changed, and held permanently to their places by the arm catch and the drop catch. 2d, The arrangement of the oscillating foot brace, in combination with a lady's foot-stool. 3d, The arrangement of the spittoon-holder.

125. METHOD OF SECURING THE CUTTERS TO THE SPINDLES OF AUGERS; Charles L. Barges, City of New York.

Claim—The combination of the spindle, cutter, and cheek nut, for the purpose of securing the cutter to the spindle.

126. CORN PLANTERS; Thomas M. Bedgood, Cleveland, Indiana.

Claim—The combination of the truck wheel, cam wheel, lever, and gauge, when constructed and arranged in relation to each other and to the seed-box and spout, as described.

127. MACHINE FOR SOWING FERTILIZERS; Lyman Bickford, Macedon, New York.

Claim—A hopper bottom formed of sheet metal, or its equivalent, in which are arranged apertures, constructed as set forth, when combined with a series of vertical stirrers, slide or slides, arranged on the inner side of the bottom, in the manner described.

128. PLOUGHS; Wm. Black, Manchester, Pennsylvania.

Claim—The combining with the plough the adjustable rotary digger, having sharp teeth or picks, substantially as described.

129. STEAM HEATING APPARATUS; Henry G. Bulkley, Kalamazoo, Michigan.

Claim—The surrounding of the air passages by a steam atmosphere, to which heat is applied after the steam is generated, for the purpose of increasing the temperature of the steam without high pressure, for making a rapid, safe, economical, and wholesome heat.

130. MILL PICK HOLDERS; Jacob P. Brady, Mountjoy, Pennsylvania.

Claim—The double socket pick holder, when constructed as described, and used in combination with the diamond-shaped picks, in the manner set forth.

131. CORN PLANTERS; John S. Davis, Arcadia, Ohio.

Claim—The adjustable guards, truck, and adjustable hoppers, in combination with the adjustable connecting rods, lever, and rod, the whole combined and operating in the manner described.

132. BRICK MACHINES; J. W. Crary, New Orleans, Louisiana.

Claim—1st, The combination of an annular rim or concave moulding surface, with a roller or convex

pressing surface, so that the bricks are moulded by pressure operating toward the circumference, and discharged in a direction toward the axis of said concave moulding surface. 2d, Arranging a pug mill for the preparation of the dry clay, to work in connexion with said first feature of my invention, by means of the gearing described.

133. OPERATING STEAM TRIP-HAMMERS; Joseph S. Bonney, Hanson, and Charles W. Willard, Bridgewater, Massachusetts.

Claim—The arrangement and application of the parts, the same consisting not only in having a curved pendulous lever to extend from the hammer shank, or a projection therefrom, and play through and in the valve rod, as described, but in arranging and applying cams and adjustable bearers with respect to the said lever, and to operate together and produce a reciprocating motion of the lever.

134. REVOLVING FIRE ARMS; W. W. Elliott, Plattsburg, New York.

Claim—Extending the frame of the breech forward of the supporting point of the cutter pin, and placing in the part so extended the cock and trigger, when these devices are arranged in relation to the several revolving barrels, as specified. 2d, The arrangement of lever o, and trigger in advance of dog and ratchet, by which the barrels are revolved. 3d, The method of operating the cock by means of fly, the same being hinged at or near the centre of motion of the cock, and moving independently of the cock in one direction, but not in the other. 4th, The employment of wings when so constructed as to serve the double purpose of bracing the support of the centre pin, and of protecting the hands from injury by the discharge of gases and pieces of caps from the nipples, and being a portion of the frame of the breech, as set forth.

135. PESSARIES; Wm. Elmer, M. D., City of New York.

Claim—Giving the peculiar form to the curved bar or tube, described and represented, and attached to its posterior or rear part a ring-shaped cup or inverted frustrum of a cone, in such relation thereto as to enable the instrument to perform the functions for which it is designed.

136. METALLIC BANDS FOR BINDING BALES; Wm. Field, Providence, Rhode Island.

Claim—Arranging the band over the clasp, and the ends of the band which are bent under to form the loops by which the band is connected with the clasp, so that the ends lay above the clasp and the band covers and protects both of these ends, and also the clasp. 2d, Connecting the looped ends of the band with the clasp, by means of a double key, or its equivalent, so that the turning of the key prevents the loop from slipping. 3d, Arranging the key or keys on the under side of the band and clasp.

137. STOVES; Cornelius O. Foley, Troy, New York.

Claim—1st, The arrangement within the outer casting of the stove of the chambers, G D, descending and ascending flues, and exit pipe, with the open front cumbustion chamber, B, provided with the opening, F, as described, whereby what is known as the "Franklin stove" is made a good radiator without materially impeding its draft, as set forth. Also, the division plates, E, furnished with the opening, F, and constructed and arranged in combination with the chambers, G D, flues, smoke pipe, and fire chamber, B, in the stove.

138. MACHINERY FOR PREPARING OVAL PICTURE FRAMES; Wm. Gardner, City of New York.

Claim—A lathe with a face plate revolving in an oval path, in combination with a scraper adapted to the form of the desired moulding of the oval frame, when the said scraper is so arranged as to be self-adjusting laterally with the said moulding.

139. LOCK; Fayette Gould, Huntington, New York.

Claim—1st, The rotating plate or boss placed within the annular ledge, and provided with a key chamber or recess and yielding or elastic pin, in combination with the sliding tumblers, notched or recessed as shown, the above parts being arranged substantially as set forth. 2d, The rotating plate or boss arranged with the sliding plate and tumblers, in combination with the check or guard tumblers.

140. WRENCH; Francis D. Haywood, Walden, Massachusetts.

Claim—Combining with the head or upper jaw, when rigidly connected with its shank, a brace and screw arranged respectively on opposite sides of, and parallel with, the said shank, for the purposes of insuring true play of the slide or jaw, and of keeping the slide and head constantly parallel.

141. MACHINE FOR CUTTING MITRES; Stephen W. Hall, Williamsport, Pennsylvania.

Claim—1st, The use in mitre machines of the flanches and the groove in the frame, for the purpose of guiding and sustaining the outer and inner edges of the knives, and preventing them from springing. 2d, The combination together of the flanches, the frame with the groove and sliding rest, substantially in the manner set forth.

142. APPARATUS FOR HEATING MASH TUBS; Adolph Hammer, City of New York.

Claim—The arrangement on the outside of the mash tun, described, and in combination therewith of a steam heater, in such a manner that any suitable quantities of the fluid extract of the malt may, at the discretion of the operator, be withdrawn from the tun through the said heater, so as to be warmed by the latter as it passes through the same to any suitable receiver provided for the purpose, that it may immediately afterward be returned into the tun for the purpose of raising the temperature of the mash therein to the degree required, as described; the said heater being connected with the interior of the tun, and the said pipes being provided with cocks.

143. NAIL PLATE FEEDER; John W. Hoard and Thomas A. Searle, Providence, Rhode Island.

Claim—1st, The polygonal concave sided and oblique grooved feed bar, applied in combination with the pins on the feeding shaft, to produce the feed movement of said shaft by its own revolution, and to provide for variation in the feed. 2d, The arrangement of the feed bar, the driving shaft, and driving gear, and the plate, for throwing out the stop pawl of the running back mechanism in the same movable frame, which is liberated by a latch lever, actuated by the feeding shaft, and thus permitted to be operated upon by a spring, or its equivalent.

144. MODE OF SECURING AND ADJUSTING THE STEPS OF MILL SPINDLES; Gideon Hotchkiss, Windsor, New York.

Claim—The double fulcrum lever operating outside of the shell and over the base, resting on two raised fulcra on the shell fitted to said levers, and the suspending the sway bar and pot by means of sway bolts passing through said lever, in the manner described—also the flanches on the bottom of the pot. Also, the manner of supporting the regulating screw on an adjustable base or safety lightener, by which the stones can be quickly raised and returned again to the same position, in combination with the foregoing arrangement.

145. RECIPROCATING SAWING MACHINE FOR SAWING PLANK; Wm. C. Huntington, Newark, New Jersey.

Claim—1st, Connecting the saw wheels to the cross-heads by pivots, when the saw is worked without a saw gate, and is strained and tightened by being attached to a tightening belt. 2d, The combination of the

cam-shaped feeding and retaining dogs, operating in opposite directions to each other with the flanched disk, for the purpose of communicating a feed motion to the lumber being sawed, and retaining the lumber firmly in place while the saw is cutting it.

146. CONSTRUCTION OF CANAL BOATS; Anson Judson, Unadilla, New York.

Claim—The wide openings in the bow and stern of the boat, extending to or near the full width of the boat, and as low as the bottom.

147. SMUT MACHINES; J. N. Lester, Oswego, New York.

Claim—The rotating conical plates attached to the hollow shaft, in combination with the stationary conical plates, rims, cylinder case, and fan, the plates being provided with scouring ledges, and the whole arranged relatively with the fan, induction spout, and blast spout.

148. BRIDGE; Stephen H. Long, Louisville, Kentucky.

Claim—1st, The combination of the suspension truss frame with the suspension arch or arches, or the arch stay. 2d, In combination with the truss frame, the auxiliary stays, arranged therein, as a means of strengthening and fortifying said truss frame, as stated.

149. AMALGAMATING GOLD AND SILVER; Samuel Longman, Brooklyn, New York.

Claim—Masticating or kneading, in the manner set forth, the dry metalliferous powder of the gold and silversmiths' sweeps, scraps, and polishings, or the native precious metals, when so prepared with quicksilver, when sprinkled with barely sufficient water to cause the mass to agglutinate.

150. ROCK DRILLS; W. W. Loomis and John Hewitt, St Louis, Missouri.

Claim—The combination of the two grooved guide rods with the drill bar and the two pawls and nuts, whereby the two guide rods are allowed to fall with the drill bar, so as to keep the top and bottom guides always the same distance from the end of the drill bar.

151. EXCAVATING MACHINES; Wm. R. Maffett, Wilkesbarre, Pennsylvania.

Claim—1st, The arrangement of excavating implements on either end of the beam, in such manner that the weight of one scoop or implement is made to counterbalance and assist the other, the said beam being capable of moving longitudinally forward or backward, and of swinging to the right or left, or up or down, each motion being had separately or in combination, whereby the loading of one digging implement and the dumping of the other form part of the same operation. 2d, Constructing and arranging the toothed picker and scoop in such manner that they may be turned with respect to the beam. 3d, In combination with the arrangement for turning the scoop and picker on the beam, I claim attaching them so that they may separately be turned on their own axis, whereby the toothed picker may be made to perform the duty of both a digger and a rake, and the scoop that of a shovel and hoe or scraper.

152. REAPING MACHINES; C. W. and W. W. Marsh, Shabbona, Illinois.

Claim—The box or receptacle, I, platforms, J, M M, and box, K, provided with the hinged or adjustable bottom end piece, l p, when the above parts are used in connexion with the endless bands of rakes, D E, and arranged relatively with each other, as set forth.

153. FEED MOTION FOR CEROTYPOGRAPHY; John McElheran, Brooklyn, New York.

Claim—The manner described of causing the type, by their insertion in an adjustable type socket, or its equivalent, to regulate their own required position relatively to the impression surface.

154. LANTERN FOR BURNING COAL OIL; Max Miller, Brooklyn, New York

Claim—The inverted cup provided with the perforated band and placed over the lamp, the band encompassing the wick tube cap, in combination with the glass cylinder and the tube, or its equivalent.

155. STEERING APPARATUS; Franklin A. Morley, Sodus Point, New York.

Claim—The combination of gears and shafts, arranged for operating the rudders of vessels, and at the same time allow them ample room to traverse perpendicularly and vibrate slightly horizontally. And in combination with the above, I claim making the journals of the shaft longer than the boxes in which it turns, or elongating the hole in the box so the shaft can vibrate horizontally on both of these devices combined to accommodate the pinions, and make them act with the same power or force on each of the gears.

156. CARPET CLEANER; Augustus W. Noney, Bridgeport, Connecticut.

Claim—The combination and arrangement of said flaps or drags, and the said shields, with the revolving cylinder brush, box, and dust-pan, in the manner described.

157. GRAIN DRILLS; Adam Pritz, Dayton, Ohio.

Claim—1st, The employment of a distributing slide which has two sets of different character of discharge passages, and a connecting rod having two adjusting notches, in combination with a set-screw which has a serrated sliding cap, and with a slotted actuating lever which has a serrated rib on its upper side. 2d, In combination with the above, the employment of short flanched metal tubes for securing the flanched gum or leather conducting tubes to the drill frame.

158. MACHINE FOR FORGING NAILS; S. S. Putnam, Boston, Massachusetts.

I do not limit my claims to machinery for any particular class of forging, but intend to apply them to forging machinery wherever they may be applicable.

Claim—1st, Hanging the springs which actuate the hammers at points independent of the pivots upon which the helves vibrate, and so far removed therefrom that they shall bear upon the helves nearer to the hammer faces, when the hammers are raised, than at the instant when the blow is given, as set forth. 2d, The spring, E, for actuating the hammers, in combination with the set plates, F, and screws, V, for regulating the tension of the same, as set forth. 3d, In combination with the hammers, A, and side pieces, B, I claim the adjusting checks, operating in the manner described. 4th, And in combination with a mechanical cut-off, I claim holding the hammers out of action and without the reach of the cutters whilst the nail is being cut off. 5th, Pivoting the lever to any adjustable block, for the purpose of regulating the motion of the nail rod, as set forth.

159. THRESHING MACHINES; Samuel D. Reynolds, Lane, Illinois.

Claim—Arranging a band cutting and stalk spreading cylinder, with the threshing cylinder of a threshing machine, substantially in the manner set forth.

160. REVOLVING FIRE ARM; Joseph Rider, Newark, Ohio.

Claim—1st, Combining the springs with the hammer, the rotating dog, and the peculiarly constructed notched trigger, by means of the reacher, constructed, applied, and operating substantially as described, to

make the single spring serve the purposes of main spring, dog spring, and trigger spring. 2d. The combination of the stop lever, l m, with the notched trigger and the reacher, by which the said stop is brought by the single spring, s, into operation on the cylinder as the cocking takes place.

161. WASHING MACHINE; D. C. Rood, Altona, Illinois.

Claim—Having the rotating cylinder provided with a flap or door, flap or fastening, and covered by an inflated band or belt or any suitable cloth or fabric, in combination with the yielding concave provided with the corrugated board and rollers, the whole being placed in a proper box, and arranged substantially as set forth.

162. SEED PLANTERS; Jonathan H. Rose, Versailles, Illinois.

Claim—The seed distributing device formed of the slide, bent or lowered, as shown, and the adjustable bar fitted in the seed box, the whole being arranged and connected with the plough for joint operation.

163. ANDIRON; J. B. Sargent, New Britain, Connecticut.

Claim—The construction and arrangement of the legs, the fire-iron, the pillar, all secured together by the bolt in the nut, in the upper portion of the pillar, all of which can be readily detached when desired.

164 BOMB LANCE; Rufus Sibley, Greenville, Connecticut.

Claim—1st, Uniting the front and base of the bomb or projectile by tubes or bars in skeleton, substantially as set forth. 2d, Confining the fuse in the fuse tube by drawing down the end of the tube upon the fuse after it is placed therein. 3d, In combination with the skeleton shank or connexion, the wings, whether used in pairs or singly, but so that they may be pressed down into and snugly fit the spaces between the skeleton ribs, tubes, or bars, and be thrown out when the bomb is projected.

165. BUTTER BUCKET; J. W. Stimpson, Baltimore, Maryland.

Claim—The new article of manufacture, the same being the double walled butter bucket or kettle, constructed as set forth.

166. OPERATING CHURNS, &c.; Moses Swan, Potter Hill.

Claim—The arrangement of mechanism specified, for combining the churn tub with the wash tub, and giving the plunger and dasher of the same an up and down movement, and at the same time imparting a rotary motion to both tubs.

167. NAIL PLATE FEEDER; James H. Swett, Pittsburgh, Pennsylvania.

Claim—In combination with sleeve, E, and rod, F, the cam slots and pivoted switch for automatically turning said rod, first in one direction and then in the opposite one, for the purpose set forth. Also, giving the rod and nail plate a positive movement during the first of its forward motion by means of the crank, pitman, arms, cross-head, levers and their projecting portions, which are then forced apart by the cam wedge, and then releasing them by the action of the springs whilst in motion, so that their momentum will carry the nail plate up to the gauge. Also, in combination with the nail plate gripers, the spring dogs, for automatically opening said gripers to drop the end of the nail plate and be ready to receive another one. Also, in combination with the rod, F, and swinging plate, M, with its stud, the ledge, S, with its openings, for automatically throwing the feed within out of gear, when the nail plate is used up, and into gear again when a fresh plate is supplied Also, in combination with the plate, M, the traversing projection for catching and drawing back said plate, when the nail plate is used up.

168. COMBINATION SHOE TOOL; D. J. Tapley, Danvers, Massachusetts.

Claim—The combination and arrangement of the "tack hole stamp," "last hook," and "peg cutter."

169. SEWING MACHINES; Wm. P. Uhlinger, Philadelphia, Pennsylvania; ante-dated May 3, 1858.

Claim—The vibrating finger, in combination with the needle and looper, arranged and operating substantially as described.

170. MACHINES FOR DIGGING POTATOES; Alex. Wells, Brooklyn, New York.

Claim—The rotating spirally flanched diggers in connexion with the clearers, arranged for joint action.

171. MACHINES FOR DIGGING POTATOES; Luke White, Essex, Vermont.

Claim—The combination of wheel, c, having buckets on the outer edge thereof, with wheels, d, and separator, e.

172. PRINTING PRESSES; Daniel Wolfe, Dixon, Ohio.

Claim—The self-emptying spring friskets arranged with the springing frames, in the manner set forth, and these in arrangement with the stationary bed plate, falling platen frame, bars, and lever, when all are combined and constructed in the manner set forth.

173. GRAIN SEPARATORS; L. Wilcox, Hudson, Michigan.

Claim—1st, The reciprocating feeder bar provided with projections placed at the bottom of the hopper, and attached to the shoe. 2d, The two sets of screens placed within one and the same shoe, and arranged relatively with each other and the hopper. 3d, Giving the screens a vibratory movement independent of the shake motion of the shoe through the medium of the rods, m m, screens, H, and rod, O. 4th, The screen attached to the shoe by the rods, m n, provided with the bars, S, and the rock bar, O.

174. GAS BURNERS; Wm. Wright, St. Louis, Missouri.

Claim—The adjustable valve, in combination with the chamber in which the said valve seats and the adjusting nut around the said valve, whereby the joint is made tight in any given position for the purpose specified.

175. SEWING MACHINES; J. S. Buell and W. T. Barnes, Assignors to J. Forsyth, R. D. Rockwell, V. M. Rice, and W. T. Barnes, Buffalo, New York.

Claim—1st, The arrangement of the springs with the feeder bar and feeder, each operating in the manner specified. 2d, The looping apparatus, composed of the frame work, the spear, the hooks, and the guide, operating substantially in the manner described.

176. CLOTHES' HORSE; E. Culver, Jr., Assignor to self and S. M. Blackwell, Shelburne Falls, Massachusetts.

Claim—The combination of the panels, B, panels, C, and connecting links, I I', with a self-supporting pedestal, the whole arranged to operate as described.

177. CHUCK FOR LATHES; Simeon Goodfellow, Assignor to self and John Fish, Troy, New York.

Claim—The button or stop attached to the slide and arranged relatively with the jaw, for the purpose

specified. Further, adjusting the frame by means of the screw, when said frame is arranged with the jaws and screws, whereby the chuck may be used either as an eccentric or concentric one, and manipulated with equal facility in either capacity.

178. CARPET SWEEPER; H. H. Herrick, Assignor to Lafayette Culver, East Boston, Massachusetts.

Claim—1st, Inclining or grooving the brush shaft as at o and k, as described. 2d, Protecting the bearings from dust by means of the plates, operating in the manner described. 3d, The peculiar construction of the dust pan, with its spring lip, in combination with the screen, operating as set forth. 4th, Dividing the brush in the centre and connecting each half with one of the driving wheels, as set forth, in combination with the method described of pivoting the inner ends to a suspended support, whereby the continuity of the brush is not interrupted.

179. SEWING MACHINES; T. D. Jackson, Assignor to Joseph W. Bartlett, City of New York.

Claim—A swinging thread guide attached to the cloth presser, and operated by, and in combination with, an oscillating hooked or barbed needle, constructed substantially as described, whereby I am enabled to secure the taking of every stitch, and render a single thread machine effectual.

180. STEAM VALVES; Wm. S. Mackintosh and Samuel Wadsworth, Assignors to Cridge, Wadsworth & Co., Pittsburgh, Pennsylvania.

Claim—The arrangement of three hollow valves with their stems and ports, and the passages in the valve box, in the manner set forth.

181. ADDOMETERS; L. N. Nutz, Alton, Assignor to I. B. Randle and E. Hibbard, Madison Co., Illinois.

Claim—The feathered shaft, when combined and arranged with a series of indicators and a set of keys, substantially as described, for the purpose of enabling the operator to add up and register any number of columns of figures in succession by means of the same set of keys.

182. STEAM COCK; J. L. Winslow, Westbrook, Assignor to J. N. Winslow, Portland, Maine.

Claim—Arranging the operating screws at the foot of the plug and its case, so as to be capable of being rotated therein, without at the same time having any longitudinal motion. Also, making the spindle separate from the plug, and combining with them and the case the bearing shoulder and the clutch connexion.

AUGUST 24.

183. MACHINERY FOR MAKING ROPE; Newton Adams, Lansingburg, New York.

Claim—The combination of a revolving flyer containing a capstan and reel, with the revolving strand flyers revolving around the laying spindle, producing and controlling the rotary motion of the strand spindles or flyers on their own axis, by means of the stationary or moving belt, acting on pulleys on the said spindles or flyers, the pulleys, worm wheel, and stationary or moving endless screw.

184. VAPOR LAMP BURNERS; Solomon Andrews, Perth Amboy, New Jersey.

Claim—1st, The combination of the wick tube, the gas chamber, and the caloric conductors in a gas lamp, as described. 2d, A cotton or other fibrous wick made hollow by a wire gauze tube, or its equivalent.

185. LATHE FOR TURNING BEADED WORK; Frederick Baldwin, South Wardsboro', Vermont.

Claim—1st, The stationary mandrel provided with the movable or adjustable dies and spurs, rotating cutter disks, provided respectively with the cutters, the feeding nut, and the rotating pattern actuating the cutter, through the medium of rod, collars, and plate. 2d, The guide and wheel provided with the stop pin, l, pin, o, and bar, n, in connexion with the slides connected by the spring, the lever, clutch, and collars, provided with the pins. 3d, The feeding nut placed in the cutter disk, in combination with the stationary mandrel and cutter disk.

186. RAILROAD RAILS; Sidney A. Beers, Brooklyn, New York.

Claim—The construction of cast or other iron rails, as set forth, when combined in their formation with the lugs or cleats, as shown, for the purpose of receiving a flat iron plate or wedge for securing the ends of the rails evenly together, and giving the rail additional strength at the point of connexion.

187. SPINNING MULES; James H. Brickill, Taunton, Massachusetts.

Claim—1st, Arranging the winding gear loose on a stationary bushing, or its equivalent, which surrounds and forms one of the bearings of the winding shaft, and applying a pawl attached to said gear, a spring fitted to the bushing to engage the gear with a ratchet wheel, fast winding shaft, in the manner described, whereby the winding shaft and winding gear are permitted to be entirely disconnected during the operation of backing off. 2d, The combination of the adjustable cam on the rock shaft, the loose pulley, working on the stationary bushing, or its equivalent, surrounding the winding shaft, the pawl on said pulley, the clip spring on the bushing, and the ratchet wheel on the winding shaft, to effect the backing off of the yarns—and in combination with the pawl, I claim the pin applied to disengage said pawl, and permit the reversal of the shaft to wind on the yarns. 3d, The combination of the brake wheel on the winding shaft, the brake and the tooth on the belt shipper, for the purpose of stopping or reducing the momentum of the winding shaft previous to the operation of backing off.

188. ADDOMETER; Jabez Burns, City of New York.

Claim—1st, The toothed wheels, when arranged in the particular manner described, relatively to the arc index plates, in combination with the toothed wheels of the registering cylinders and stop. 2d, The particular arrangement, in combination with the above, of pins, on the sides of the finger wheels, toothed segments, and pins, c, on the sides of the registering cylinders.

189. COUPLING FOR RAILROAD CARS; Jesse Campbell, V. B. Leghtiser, and Patrick Shannon, Steubenville, Ohio.

Claim—The link, made rounding at the point, with square offsets on each side, in combination with the jaws, the spring, chain, and hand wheel, or its equivalent.

190. APPARATUS FOR COOLING AND VENTILATING GRAIN; Charles D. Clark, Chicago, Illinois.

Claim—The arrangement of cylinder provided with rectangular grates and the blast pipe, A, and separating cone, operating in connexion with the blast through the pipe, E.

191. ROOFING COMPOSITIONS; Abram Davis, Chicago, Illinois.

Claim—The method of applying a cement having the composition set forth, namely, by first saturating canvass, or other suitable fabric for roofing, with asphaltum, softened and tempered with crude kerosene oil, or its equivalent, in the manner mentioned, and secondly, by covering this layer or foundation with a cement formed of india rubber and other ingredients.

192. CARPENTERS' WORK-BENCH; Justin Devoge, Randolph, Pennsylvania.

Claim—1st, In regulating the inclination of the cutting instrument to the angle required, to give the edge of a board a given bevel by raising or lowering one of the jaws of the clamp between which the board is held, substantially as described. 2d, The combination of the bevel boards, arranged as described, with the jaws of the clamp.

193. QUARTZ CRUSHERS; A. J. Doolittle, Nevada Township, California.

Claim—Arranging the stampers of a quartz crusher in such a manner that they are guided in their up-and-down motion by two springs, which at the same time serve to increase the force of the blow, in combination with the pans which are placed loosely under the stampers, so that they are free to rotate under the action of the blows, and which have openings in their sides, the size of which is different for different pans, and depends upon the relative coarseness of the quartz, so that the finer parts of the quartz escape, and the coarser ones are continually exposed to the full force of the blows, the whole being arranged substantially as set forth.

194. WRITING DESKS; John W. Fiester, New Lexington, Ohio.

Claim—The arrangement of rollers with coiled springs attached, with the horizontal cords on pulley, the canvass arranged on the rollers and scales, and the hand board hinged to the desk.

195. SEWING MACHINES; R. B. Fitts and Milton D. Whipple, Charlestown, Massachusetts.

Claim—1st, The "keel guide" beneath the pressure foot, operating as set forth. 2d, Causing the shank of the needle to play vertically in guides, and connecting the pitman directly thereto, as described. 3d, Securing the needle in place by means of the pin, when its shank is provided with a notch to insure its proper position with respect to the hook and the table. 4th, The peculiar arrangement of the bar and its post, with the bent lever, and sliding plate, and spring.

196. CAR SEATS AND COUCHES; I. N. Forester, Fairfax Court House, Virginia.

Claim—1st, Combining with car seats an auxiliary back and bottom, which are adjustable, said auxiliary back and bottom, being arranged as set forth. 2d, The ratchet teeth and spring pawls, combined and arranged in the manner set forth.

197. SEEDING MACHINES; Joseph Fowler and F. M. Bacon, Ripon, Wisconsin.

Claim—The combination of the rotary perforated cylinder, E, board, H, and toothed bars, I, arranged for joint action, as described.

198. CARTRIDGE FOR FIRE ARMS; Edwin Gomez and Wm. Mills, City of New York.

Claim—The manner specified of forming cartridges for fire arms, and other purposes, by alternate layers of explosive material and paper, or similar substance, for the purposes. Also, the winding of string, or equivalent material, attaching the case to the base of the ball, for the purpose of removing said case and any refuse matter from the barrel.

199. MACHINES FOR CUTTING UP CORNSTALKS IN THE FIELD; Francis M. Green, Sullivan, Illinois.

Claim—The knife cylinder constructed and operating as described, in combination with the supporting wheels and the mechanism for operating the same.

200. PORTABLE FIELD FENCE; John B. Johnson, Linden, Indiana.

Claim—The mode of locking the panels at the top, so as to prevent their being drawn apart longitudinally or endwise; and also the mode of locking the panels at the bottom, so as to prevent them from being pushed or slipped by one another, when the parts are arranged in relation to each other, as set forth.

201. CROSS-CUT SAWING MACHINE; Albert Heth and Gaylon Hall, Adams' Centre, New York.

Claim—The lever and oscillating platform connected by the rods, and attached to the saw bar or beam, J, by the pendant, the above parts being used in connexion with the beam, A, and cross-bar, B.

202. METALLIC SPRING; James Harrison, Jr., City of New York.

Claim—The coiled spring described, having the several revolutions of the coil approximating to the form of cones, or in other words, having the sides of its several coils inclined to the axis thereof.

203. SEEDING MACHINES; Paul Hildreth, Beloit, Wisconsin.

Claim—The arrangement of the cone or graduated pulleys and the feed auger, in connexion with the revolving distributing cylinder and the distributing adjustable feeder.

204. SEWING MACHINES; Elias Howe, Jr., Brooklyn, New York.

Having described my invention, and the manner in which I have deemed best for embodying it in mechanism, I wish to be understood that it is not limited to the precise construction described, but that it may be modified as circumstances may render expedient to adapt it to different sewing machines, or to meet the views of different constructors. Thus, for example, if a curved shuttle race is employed, as is the case in some machines, the arm, F, may be pivoted at the centre of the circle of which the race is an arc, and its extremity may terminate in the recess at the butt of the shuttle, thus driving the latter directly without the interposition of the connecting bar or driver, D. I am aware that the shuttle of a sewing machine has been operated by seizing by one of its ends in a forceps; but the construction and operation of the mechanism in this case is such as to render it necessary to apply the driving apparatus to the shuttle, and to disconnect it therefrom at each movement of the shuttle. I do not, therefore, claim imparting motion to a reciprocating shuttle by seizing one of its ends intermittently by a forceps. But I

Claim—Imparting a reciprocating movement to the shuttle of a sewing machine by the application of a driver to one point only of its length, substantially as set forth, in such manner that the driver need not be disconnected from the shuttle. Also, constructing the shuttle driver in such manner that it is guided by a race parallel with the shuttle race, or its equivalent, and is at the same time supported and prevented from sinking out of its proper position by pivoting its stock perpendicularly to the table of the machine, in a socket in the arm which imparts motion to it, substantially as set forth.

205. RUNNING GEAR FOR RAILROAD CARS; James Ingersoll, Grafton, Ohio.

Claim—1st, The manner described of constructing the rollers with long or short axles, so that they shall extend down along the sides of the rails of the railroad, and the axles rest upon said rails. 2d, The employment of an internally toothed endless chain and an externally toothed driving wheel, in combination with an endless ellipsoidal guide way, and an endless series of rollers.

206. WASHING MACHINES; Wm. A. Jordan, Thibodeaux, Louisiana.

Claim—The combination of the tube, C, slotted shaft, F, and pin or key, G, attached respectively to the tub, A, and disk or rubber, U.

207. MUSIC STOOL; Edwin Leach, Norwich, Connecticut.

Claim—The rods, annular or serpentine base, boss, nut, and screw, when arranged substantially as shown.

208. BED BOTTOM; Rufus Leavitt, Cambridge, Massachusetts.

Claim—The construction of an elastic bed bottom, by means of a series of springs, constructed substantially in the manner described.

209. MACHINES FOR BREAKING HEMP; Samuel H. Little, St. Louis, Missouri.

Claim—In combination with the main beating cylinder rotating in a fixed vertical plane on the permanent frame of the machine, the arranging of the feeding apron, breaking and crushing rollers, and concave in a second frame adjustable on the first one, so that when it becomes necessary to adjust the concave to the beater cylinder, the parts preceding the concave in the operation shall always maintain the same relative positions to it and to each other, as set forth. Also, the arrangement and operation of the beater cylinder, the concave, the reel, and carrying apron, all as described.

210. ROTARY HARROWS; Wm. H. Main, Liverpool, Ohio.

Claim—The manner described of causing a harrow to rotate, namely, by means of the standard, the slot in the bar, and spring. Also, the manner of raising the harrow from the ground by means of the adjustable bar and recesses. These several devices, combined as described, I claim in combination with a seeding machine.

211. RAILS FOR SWITCHING CARS OFF THE TRACK; John C. Mather, City of New York.

Claim—Providing the shoe with two frogs, in the manner set forth.

212. HARNESSES; Freedom Monroe, Romeo, Michigan.

Claim—The combination of the rigid bow whiffle-trees with the front coupling bar or tree, connected by swivel joints, said bows having hooks or other appliances for connecting the ends with an ordinary plough harness, operating in connexion with the central draft bar or chain.

213. HORSE RAKES; Mirrick Morgan, Lancaster, Pennsylvania.

Claim—The arrangement of the axle and clearers with teeth, having curved ends, hinges, and roller, constructed for joint operation.

214. HARROWS; Daniel B. Neal, Mount Gilead, Ohio.

Claim—The arrangement of the troughs, B and C, (one oscillating and adjustable, the other being stationary, and both provided with balls,) with a revolving harrow.

215. ICE STAND; Henry A. Roberts, Hartford, Connecticut.

Claim—An ice stand, with convoluted angular shape drip supports arranged in an adjustable frame, with the cross channel, flexible discharging tube, and rollers.

216. ELASTIC FABRICS; John W. Newell, New Brunswick, New Jersey.

Claim—An elastic fabric formed by the application of an elastic gum to the side of braid.

217. OVENS; E. Graves Otis, Yonkers, New York.

Claim—1st, The construction of ovens with the floor upon which the baking takes place running spirally around the inside of the oven. 2d, The rotary cylinder arranged and operating substantially as set forth. 3d, Placing the spiral chamber in which the baking is performed in communication with the hot air chamber, W, above the fire chamber, by means of the chambers, G, and the openings controlled by the dampers, for the purpose of regulating the temperature in the several portions of the said spiral chamber.

218. METALLIC BANDS OR TIES FOR BALES, &c.; Increase C. Plant, Macon, Georgia.

Claim—The bale tie or lock made open at one edge and both ends, so that the band may be inserted in it edgewise, in the manner described.

219. SEEDING MACHINES; D. B. Keiper and A. C. Fox, Texana, Texas.

Claim—The combination of the endless band, oscillating arms, and adjustable plate, arranged relatively with each other as shown, whereby the seed is properly agitated and kept, when reduced within the box, within the reach or path of oscillation of the arms.

220. PACKAGES FOR DRY GOODS; Alexander Robertson, Upper Holloway, Middlesex Co., England; patented in England, June 26, 1855.

I do not intend to confine myself to any particular kind or description of wood, although I prefer wood of close grain and texture, and in some instances I line or cover the inside of the package with tin foil or paper.

Claim—The new manufacture and process and method of manufacture of packages for dry goods, by the combination of wood and iron, or other metal, and constructed and made in manner described.

221. STEAM COCK; Robert Ross and Willard Holland, Philadelphia, Pennsylvania.

Claim—1st, The loose valve plug fitted to the seats above and below, as set forth. 2d, In combination with the loose valve plug and the shoulder on the stem, the nut with its plane and concave faces, as described. 3d, The projecting stem passing through the loose valve plug, and fixed fast to the guides, as set forth. 4th, In combination with the valve stem, the upper spring valve, as set forth.

222. MACHINERY FOR BOLTING FLOUR; Benjamin D. Sanders, Holliday's Cove, Virginia.

Claim—Depriving superfine flour of fine offal or impurities by re-bolting it, after escape from the head of the first reel in or by a second reel, apart from the main body of meal or coarse meal and coarse offal in the first reel. Also, re-bolting the coarser grades of fine offal and material admixed therewith, passing off at the tail end of the second reel, by or in a third reel, for restoring to the superfine flour that which belongs to it, and for the more perfect separation, without waste, of impurities therefrom.

223. HARPOON LANCE; Nathan Scholfield, Newark, Connecticut.

Claim—1st, The several modes described of applying the sliding and extension cases, either with or without spurs, on the anterior part of a cylindric projectile, so as to extend either wholly or partially without the bore of the gun before its discharge, and while the projectile is in its position therein. 2d, Attaching the ring or collar holding the line of a harpoon lance to be fired from a gun to the rear end of a sliding case, with or without spurs, and on which a portion of the said line may be coiled if desired, preparatory to being projected. 3d, Connecting a lance head and shank of a harpoon lance to be fired from a gun to a cylindrical shell by a sliding socket joint, so that when forced in, or in place, the joint shall remain rigid and inactive, but when drawn or forced out, it shall be susceptible of flexibility by turning on its pivot.

224. Bolt Machine; Elisha Simkins, Allegheny, Pennsylvania.

Claim—1st, The flexible connecting rod and the arrangement of the cylinder, the spiral springs, and nuts, as described. 2d, The arrangement of the lever, the ratchet wheel, the lever wheels, the screw, and the cross-head, when used in connexion with the flexible connecting rod, as described. 3d, The arrangement of the compound lever and the pulleys in connexion with the lever and stop, as described. 4th, The arrangement of the stud, the stop, the levers, and the bolster, as described.

225. Windlass; Samuel N. Smith, City of New York.

Claim—The lever, L, provided with the rack, K, which gears into the rack, J, in connexion with the rods, M M, and levers, N N, connected by the links, O, with the arms, I I, of the boxes, H H.

226. Gas Regulators; W. G. Sterling, Bridgeport, Connecticut.

Claim—1st, The described adjustable conical-shaped valve seat with its cross-bar, or its equivalent, and valve attached. 2d, The set-screw, in combination with the valve seat, or any other construction substantially the same. 3d, The combination of the movable valve seat, valve, and cross-bar, attached in any form or manner to a gasometer, disk, diaphragm, or other device, by which said regulator can be cleansed without the least derangement to the machine, as described, or in any other form or way equivalent thereto.

227. Escape; Owen Sweeney, Brooklyn, New York.

Claim—The drum with rope attached, brake, and compensating spring, and vibrating or tilting platform or board placed within the box, combined and arranged to operate as set forth. Also, the particular arrangement of the rock bar, pawl, platform or board, and strap or brake, as shown, whereby the person that descends solely by his own gravity releases the drum from the brake, and causes the car or basket to ascend, and also by the same means regulates for his descent the pressure of the brake on the drum, as described.

228. Water Metre; Franklin A. Tenney, Concord, New Hampshire.

Claim—The arrangement of the shifting weight, the spring valves, and the pins, or the equivalent of said parts, with the double chambered vessel.

229. Apparatus Attached to Steam Coils in Vats; John Frageser, City of New York.

Claim—Providing ratchets in the peripheries of the couplings and pawls, attached to the stationary supply and escape pipes, to prevent the working loose of the coupled joints by the swinging of the coil.

230. Composition for Miniature Cases, &c.; Mark Tomlinson, Birmingham, Connecticut.

Claim—The composition for useful and ornamental articles, made of shellac, Breckenridge or Cannel coal, and ivory black, in about the proportions and in the manner substantially as set forth.

[Note.—This composition consists of equal parts, by weight, of shellac, Breckenridge or Cannel coal, and ivory black. The shellac and Cannel coal are first finely pulverized, separately, and the three ingredients are then well mixed together, and fed between a pair of steam heated rollers, and one of which rotates at a higher velocity than the other, and thereby ground into a pasty mass, which, while still hot and plastic, is cut or divided by a spatula or other instrument into cakes of sufficient size to form the articles or pieces to be made. These pieces are laid upon a plate or tray, and placed in an oven heated by steam or other agency, and allowed to remain therein a short time, after which they are taken out, and while still hot are placed in steam heated dies of the requisite form to produce the articles or forms desired, and therein subjected to a heavy pressure. The pieces or articles are then allowed to cool in the dies to a degree sufficient to enable them to be taken out without any danger of bending, or otherwise injuring their form.]

231. Tempering Wire and Steel; Henry Waterman, Brooklyn, New York.

Claim—The process of hardening steel wire or thin steel in long sections, being kept under a longitudinal strain by means of the wheels, while passing through the fire in the furnace, the guide to conduct the wire directly from the fire unto the hardening bath, in combination with such hardening bath, as specified.

232. Corn Planters; Horace Whitman, Kingsville, Ohio.

Claim—The adjustable or articulating frame hinged to the machine, and provided with teeth and blades, in combination with the rock shaft, weighted lever, and lever, when arranged in relation to a seeding machine, substantially in the manner specified.

233. Corn Shelling Machines; Loren J. Wicks, Racine, Wisconsin.

Claim—The employment of the screen in the apron, in connexion with the tube provided with valves and grating, when the several parts are constructed and arranged with respect to each other and to the shelling wheel and cylinders, and operated conjointly therewith.

234. Attachments to Artificial Legs; Oliver David Wilcox, Elmira, New York.

Claim—Providing for the adjustment of the sack by means of straps and buckles applied substantially as described.

[Note.—This invention consists, firstly, in a certain system of levers connecting the leg with the thigh piece and foot, for the purpose of controlling the proper operations of the leg and foot in walking. Also, in the employment of a spring to give elasticity to the ancle joint. Further, in providing for the adjustment of the sack, which the inventor patented September 30, 1855, to adapt it to the condition of the stump, by means of straps and buckles.]

235. Locomotive Engines; Ross Winans, Baltimore, Maryland.

Claim—The combination with the smoke box of a locomotive steam engine of a blast pipe extending from within the lower end of the chimney downwards to near the lower flues, an annular space between the upper end of the blast pipe and the chimney, a diaphragm near the lower end of the blast pipe and between the latter and the bottom of the smoke box, and a nozzle directing a jet of steam into the blast pipe, the several elements of the combination being arranged and operating substantially as described. Also, the construction of the diaphragm with its upper surface sloping towards the exhaust nozzle, to cause the coals and cinders to run down by their own gravity beneath the blast pipe, thereby bringing them within the sweep of the draft, and so rendering their discharge more speedy and more certain.

236. Obstetrical Chairs; C. C. Wings, Newport, Virginia.

Claim—Passing the strap or cord through the standard of the portable chair, at a point on a level, or nearly so, with the pad and the cord around a pulley in the back of the chair, and a little above the seat of the same, so that the operation of the straps or cords will be in the direction in which the support is most needed, and the counter pressure, produced by the action of the two pads, may have the fullest effect. Also, the adjustable hand slats and the foot pieces, when arranged and combined with a portable chair.

237. Machine for Setting the Staples in Blind Slats; James Wyman, Schaghticoke, New York.

Claim—1st, The arrangement and combination of the vertically sliding punch, spring supporting and

stop bar, spring feeding slide, and grooved sliding bar or anvil. 2d, In combination with the above, the ratchet teeth of the sliding bar or anvil, dog, spring pawl, and adjustable gauge plate.

238. LOCK; Hjalmar Wynblad, West Hoboken, New Jersey.

Claim—The arrangement of tumblers provided with cogs and notches in connexion with a projection on the bolt, and operating in the manner described.

239. WATER CLOSET; Isaac Edelman, Assignor to G. W. Edelman, Philadelphia, Pennsylvania.

Claim—The casing, pipe, soil pipe, and exterior pipe, when arranged with respect to each other, and when communicating with a ventilating pipe or flue.

240. VALVE GEAR OF STEAM ENGINES; James Ferguson, Assignor to self and Lazell, Perkins & Co., Bridgewater, Massachusetts.

Claim—The employment of cams, of the form specified, applied in the manner described, to connect the valve stems with the rock shafts, which receive the tripping motion.

241. CHAIN STOPPER; Wm. H. Gray, Dover, New Hampshire, Assignor to self and A. G. Brown, Salem, Mass.

Claim—Hanging the butt of the pawl on bossings cast on the inside of the two supporting standards or ears, in combination with the shoulders, h h, on said pawl bearing against said standards, as described.

242. APPARATUS FOR BROILING, TOASTING, &c.; H. W. Harkness and W. A. Terry, Assignor to selves and Joseph Sigourney, Bristol, Connecticut.

Claim—The described broiling and toasting apparatus, consisting of case, clock movements, arms, spindle, pins, arranged and operating substantially in the manner set forth.

243. ANCHOR BALL; H. W. Harkness, Bristol, Assignor to self and J. W. Bliss, Hartford, Connecticut.

Claim—An anchor ball with flukes, springs, grooves, and staple, substantially in the manner described.

244. SEWING MACHINES; T. D. Jackson, Assignor to J. W. Bartlett, City of New York.

Claim—1st, The employment of a yielding roller, constructed for the purpose of closing the barb of the needle during its movements, substantially as set forth. 2d, And in combination with a yielding roller, the swinging thread guide to carry the thread in position for the needle to insure the stitch.

245. CUT-OFF VALVES OF STEAM ENGINES; John Jackman, Jr., Newburyport, Assignor to self and E. H. Ashcroft, Boston, Massachusetts.

Claim—The combination of the levers and the collar, as arranged and applied to the rod of the ball governor, and to the slide rod of the inclined plane.

246. HORSE COLLAR BLOCKS; B. W. McClure and George Marsh, Assignors to B. W. McClure and I. H. Windsor, Pike Hollow, New York.

Claim—The peculiar arrangement of the mould block and rim setter with the cord and stretcher, when combined in the manner set forth.

247. TRAP FOR ANIMALS; Frederick Renthe, Assignor to M. Lath, Hartford, Connecticut.

Claim—The notched curved yoke, and the application and combination of the various parts to form a rat trap, in the manner described.

248. CARPET STRETCHER; Henry Ridley, Assignor to S. P. Thatcher and Walter Stillman, Hartford, Conn.

Claim—The construction and arrangement of the clamps, strap, wheel, ratchet, pawl, in the frame work, substantially as described.

249. BURNISHING MACHINE; L. S. White, Assignor to E. W. Sperry, E. Hurlbut, and J. H. Ashmead, Hartford, Connecticut.

I have described this machine as specially adapted for burnishing spoons, oval handles, &c. It will readily be seen and understood that variations must be made for different kinds of ware, also that the same motion may be produced by different device. I do not therefore wish to confine myself to the particular way or mode of operating, as described, as, for instance, the revolving motion of the jack may be produced by arms, levers, &c., instead of gear.

Claim—The holding or rolling jacks, and the oscillating or vibrating stock, substantially in the manner described.

AUGUST 31.

250. COUPLING FOR BALE HOOPS; John Agnew, Columbia, South Carolina.

Claim—The socket provided with the double taper opening in connexion with the loops at the ends of the hoops.

251. HILLSIDE PLOUGHS; H. S. Akins, Speedsville, New York.

Claim—1st, The reversible mould-board and coulter, in combination with a reversible clevis, in the manner described. 2d, Attaching the hook to the lever which operates the coulter, thereby making the operation of reversing the hook, adjusting the coulter, and fastening both the mould-board and coulter in their respective positions by one and the same hook, and at one operation. 3d, The reversible chain clevis, for the purpose of producing reversible side draft, when connected in the manner described.

252. MACHINE FOR CLEANING HOSE, &c.; John B. Alden, Jr., and E. L. Gates, Worcester, Massachusetts.

Claim—The combination and arrangement of the brushes, one or both of which is movable to and from the other during operation, and the rolls, when constructed in the manner described.

253. COTTON SEED PLANTERS; H. P. Allen, Bowling Green, Kentucky.

Claim—1st, The combination of the hook when arranged to reciprocate with rotating hopper. 2d, The tangentially set shelves when slotted and used on the inner circumference of a rotating hopper, which has a continuous discharge passage.

254. REMOVING SPARKS FROM THE SMOKE STACKS OF LOCOMOTIVE ENGINES; Jacob A. Alter, Johnstown, Pa.

Claim—A scraper, constructed and arranged so as to scrape such parts of the spark arrester, smoke stack, and chimney of locomotive engines, and other furnaces, as require cleaning, and clean them of the soot and sparks. Also, in combination with the said scraper, a ratchet wheel and pawl, or such equivalent device as will enable the fireman to operate said scraper by hand, or connect it to some part of the engine so that it will be operated by it. Also, the pipe or spout for conducting the soot and sparks from the spark arrester or smoke stack, substantially as described.

255. Sewing Machines; Solomon Andrews, Perth Amboy, New Jersey.

Claim—The combination of the wedge and lever piece, and feeding foot, constructed in the manner as described.

256. Securing Plane Irons to the Stocks of Bench Planes; Leonard Bailey, Winchester, Massachusetts.

Claim—The application and arrangement of one or more bearers, the clamp lever, and the thumb cam, together and with respect to the top surface of the plane iron and the bearing surface or cutter seat of the throat.

257. Looms for Weaving Skirt Fringe; James Beck, City of New York.

Claim—The employment of shears in combination with the rod around which the fringe threads are carried, for the purpose of cutting the said threads on the rod.

258. Umbrellas; Charles Boernicke, Baltimore, Maryland.

Claim—Constructing a pocket umbrella, consisting of rods, D, joint lever, collar piece, rod, C, with projection stick provided with disks, and lever with springs, all combined as set forth.

259. Seeding Machines; T. J. Bottoms, Thomasville, Georgia.

Claim—The eccentric pin, lever, spring, valve, spreader, rag-pin, slide, and hopper, the whole arranged as described.

260. Portable Fence; R. J. Prown, Perry, Pennsylvania.

Claim—Constructing a portable fence without posts, by locking the panels together by means of dovetail tenons and gains, in the manner specified. Also, in combination with the above, the use of right and left-hand screws.

261. Seed Drills; O. H. S. Brumfield, Centreville, Indiana.

Claim—The teeth attached to the rod and placed between the drill teeth, when said rod is operated by the pitman and cranks, so that the teeth will have the reciprocating and rising and falling movement communicated to them.

262. Cotton Presses; T. J. Bottoms and J. A. Bullock, Thomas Co., Georgia.

Claim—The combination of the follower staff, bridle, lever, follower, and the revolving perforated box, operating as described.

263. Rotary Pump; Levi Burnell, Milwaukie, Wisconsin.

Claim—Operating the double sets of radially sliding pistons in direction at right angles to each other, by means of the three-sided stationary cam, the rotating cam box, and the cam yokes, arranged in the manner set forth.

264. Manufacturing Shears; Wm. S. Butler, Rocky Hill, Connecticut.

Claim—A pair of shears made of cast iron, with their cutting edges hardened or tempered, in the manner described.

265. Recumbent Chair; David Buzzell, Charlestown, Massachusetts.

Claim—The arrangement and application of a lever and notched cams to either or both sides of the seat frame, and to the back and leg rest, substantially as explained.

266. Printers' Composing Sticks; Alexander Calhoun, Hartford, Connecticut.

Claim—The application of the band, in the manner described.

267. Sewing Machines; D. W. Clark, Bridgeport, Connecticut.

Claim—Imparting the necessary intermittent motion to the feed wheel, by means of an endless belt and vibrating pincers, arranged as described.

268. Seeding Machines; Smith Conklin and George Newton, Sterling, Illinois.

Claim—The arrangement and combination of the plate, guide, bars, and box, as described.

269. Sun Shades; A. G. Davis, Watertown, Connecticut.

Claim—The rod provided with the hub or boss, and the pressure bar and stop, in connexion with the hollow or tubular rod provided with the ferrule, the above parts being arranged in relation with the frame and slide, as set forth.

270. Carpet Fastener; Morris Dewey and Ira Phillips, Clarendon, New York.

Claim—The pin and the set, as described, combined and arranged for fastening carpets to floors, in the manner specified.

271. Railroad Car Seats; John C. DeWitt, West Broomfield, New Jersey.

Claim—Sustaining the bottoms of the car seats on the slotted corners of the oscillating cradles, capable of being turned on horizontal transverse shafts, and combining and arranging therewith slotted bars, connected at their upper ends to the backs of the seats by bars and oscillating levers, and movable trucks with tilting platforms, in such a manner as to enable the seats to be sustained and secured in the proper position to accommodate the passengers in a sitting posture, or their bottoms and backs, to be brought to the proper angle of inclination with the tilting platforms, and in relation to each other to form sleeping and reclining couches or berths.

272. Upsetting Carriage Tire; E. J. Dodge, Port Washington, Wisconsin.

Claim—Arranging the anvil blocks or supports to rock on a centre, in the manner specified, in combination with the arranging of the jaws of the intermediate guide or support, to be adjusted separately or both together up and down.

273. Sash Fastener; R. J. Falconer, Washington City, D. C.

Claim—Extending the cap portion of the catch over and along the front edge of plate to form a catch opening flush with the edge of plate, so that the window cannot be unfastened without having the point of the hook withdrawn entirely clear from the meeting rail of the upper sash, and out of the way of the bars when the lower sash is raised.

274. Method of Sending and Receiving Messages Simultaneously over the same Telegraphic Wire; M. G. Farmer, Salem, Massachusetts.

Claim—The employment of an accessory magnet and an accessory battery to each instrument, in com-

bination with the main batteries and main magnets, and with a means of reversing the direction of the current of each of the main batteries.

275. HANGING MILL-STONES; Joseph A. Forsman, Cincinnati, Ohio.

Claim—The combination and arrangement of devices for hanging and adjusting the bedstone and runner to the frame and to each other.

276. CAR SEATS AND COUCHES; K. Freeman, Fond du Lac, Wisconsin.

Claim—Making one of the ends of car seats detachable, and the seats on one side of the car so that they can be brought in direct contact with those immediately opposite, so as to transfer the longitudinal passage way from the centre to one side of the car, and in combination with the said car seats a series of bars and rods, capable of being folded together, and contained within the lower parts of the seats, or raised and elongated so as to form supports for horizontal single sleeping berths or couches, placed one above the other at suitable distances apart.

277. STEAM COCK; Albert Fuller, Cincinnati, Ohio.

Claim—Placing the elastic plug on the valve stem between the metallic shield and cap, the parts being arranged relatively with the valve seat.

278. TOP ROLLERS FOR SPINNING MACHINES; Charles Greene, Salem, Massachusetts.

Claim—The application of a top roller of a spinning machine to its spindle, so as to be capable of rocking and rotating them.

279. METHOD OF STRETCHING BOOTS AND SHOES; George W. Griswold, Carbondale, Pennsylvania.

Claim— Stretching boots or shoes from the outside, and at any part or point, without stretching other parts or points, by means of a skeleton last on the inside and a pressing apparatus on the outside of said shoe or boot.

280. PORTABLE HOUSE BELL; Albert W. Hale, New Britain, Connecticut.

Claim—A spring hammer tongue provided with a projection, so arranged as to be operated upon by a pin attached to an arbor.

281. DRAWING BOARDS; Issacher P. Hansell, Springfield, Illinois.

Claim—The strips placed at each side of the board, and having their outer edges curved or made of concave form, and used in connexion with the square having its blade and head arranged relatively with respect to each other, as set forth.

282. MILLS FOR SUGAR CANE; Jeremiah Howard, City of New York.

Claim—The employment or use of a pump, water reservoir, and valve, in connexion with necessary pipes and cylinders, provided with pistons acting on the bearing of the roller or rollers.

283. LOCK-JOINT FASTENER FOR STUDS, &c.; Ira A. Ives, City of New York.

Claim—The spring hinged pin, in combination with the recess, substantially as described.

284. HYDRANT; James R. Higgs, Utica, New York.

Claim—1st, The cylinder, c, constructed substantially as described. 2d, The combination of the cylinder with the upper valve and its rod, when contained and operated in case, as described. 3d, The combination of the cylinder and valve with the waste rod and waste pipe, as described. 4th, The combination of the cylinder and valve with the lower valve, as described.

285. APPARATUS FOR PRISON ALARM; Wm. O. Hills, Nottingham, New Hampshire.

Claim—The tubular or chambered window or door grating, an alarm apparatus and an air pump or apparatus, as described, or the equivalent therefor, combined so as to operate together, as specified.

286. SAD IRON HEATER COVER; Wm. Heath, Bath, Maine.

Claim—The cover for sad iron heater, constructed as described.

287. LIFTING JACKS; Joel C. Jackson, Rochester, New York.

Claim—The arrangement of the screw, slides, and nut, in combination with the bar or fork, in the manner described.

288. HARVESTING MACHINES; Henry G. Kaufman, St. Louis, Missouri.

Claim—1st, The arrangement and combination of the wheel, with the devices before described, viz: the levers, turn-table, and the ratchet and standard, for the purpose of operating the said wheel so as to guide the machine and raise the knives from the ground. 2d, The combination of the finger plate with the knife plate and the knives, when these several parts are constructed in the manner specified.

289. LAMPS; James P. and Ellen Kenyon, Brooklyn, New York.

Claim—1st, Constructing and arranging the wick tubes so that the orifice of the air passage at the upper ends of said tubes may be expanded or contracted without the necessity of changing the relative position or location of the lower ends of said tubes to each other. 2d, The band provided with the ears, applied to the wick tubes, and used with or without the central strip.

290. METHOD OF ATTACHING THE SPREADER TO SAWS OF CIRCULAR SAWING MACHINES; Wm. D. Leavitt, Cincinnati, Ohio.

Claim—Furnishing the side of the saw plate with the groove or recess, when the spreading flanch is arranged therewith in the manner represented, for the purpose of preventing the end of the lumber when being sawed from butting against or catching to the end of the said flanch.

291. LOCKS; John P. Lord, Manchester, New Hampshire.

Claim—1st, The application of the guides, or their equivalents, also the groove and spring, or their equivalent. 2d, The application of the tongue and guards, or their equivalent, combined with the bolt. 3d, The application of the slotted stud. 4th, The application of the slotted rotary wards, or their equivalent, in combination with the driving pins and indicator, or their equivalent. 5th, The application of the driving ward gear and driving bolt gear, or their equivalent. 6th, The application of the key, L, in combination with the ward and bolt gears.

292. HINGES FOR WINDOW BLINDS; John Loudon and Hans Iverson, City of New York.

Claim—The combination of the lever on one part of the hinge with the plate on the other part, for the purposes specified. Also, the plates connected with the respective parts of the hinge by the countersinks, and holding said hinge in the desired position by the cam lever and notches in the plate.

293. METHOD OF SEALING PRESERVE CANS; W. W. Lyman, West Meriden, Connecticut.

Claim—Exhausting and sealing fruit jars and cans, or other similar vessels, by means of the tube, the cement, and opening, and an exhausting apparatus, by which means the operation is rendered very easy, simple, and effective, and the closing of the air vent accomplished by the same device, through or by which the air is drawn from the can.

294. SEEDING MACHINES; J. B. McCormick, Versailles, Kentucky, and Wm. R. Baker, Boston, Mass.

Claim—The arrangement and combination of the rotating wheel with the stationary plates or sharer.

295. SEEDING MACHINES; E. L. Lyon, East Randolph, New York.

Claim—The sliding seed boxes attached to the radial bars and outer end pieces of the seed boxes, being provided respectively with the recesses and the outer ends of bars projecting beyond the peripheries of the wheels. Also, in combination with the above-named parts, the covering shares.

296. MACHINE FOR BENDING FELLOES; John L. Mann, Ravenna, Ohio.

Claim—The arrangement of the mounted forming block and the system of tracks, when used in combination with the apparatus described.

297. RAILROAD CAR SEATS; C. M. Mann, Detroit, Michigan.

Claim—The two car seats, constructed so that they may be turned from the ordinary form of seats, one to the right, the other to the left, one-fourth round, bringing the ends next the windows to meet together, and the backs or hinges may be turned over and fall upon the ledge upon which the ends before rested, and are held firmly in place as a bed by the pin. Also, the bed formed in combination with the door and pillow, which, being on hinges, opens into place upon the bed for use, or may be instantly shut out of the way and out of of sight at pleasure. Also, the columns, B, each containing and concealing two counter weights, in combination with the upper and lower movable beds. Also, the general device, combining the upper and lower beds and seats with the legs and columns, and counter weights, all convertible either into beds or seats for four, at pleasure, so that all, or a part of them, may sit up or lie down in the space occupied by four persons.

298. CHILDREN'S CARRIAGE; Wm. P. McKinstry, City of New York.

Claim—The use of three draft bars or handles attached to a child's carriage, and operated as described.

299. WELDING BELLOWS PIPE; A. Pearsall, Nashville, Tennessee.

Claim—The inclined mandrel, clamps, and roller, combined for joint operation.

300. SEEDING MACHINES; Lewis Moore, Ypsilanti, Michigan.

Claim—The combination of the zigzag strip, projecting from the bottom of a reciprocating bar, with an adjustable gauge plate, which has different sized cells, and with a hopper having oblong slots or discharge passages in its bottom.

301. HEMMING GUIDES FOR SEWING MACHINES; Henry B. Odiorne, Philadelphia, Pennsylvania.

Claim—Constructing the pressure pad of a sewing machine with recesses, arranged as described, in combination with the curved tongue, or its equivalent.

302. CAR SEATS; Wm. Painter, Wilmington, Delaware.

Claim—1st, Jointing the ends of the backs of the seats to the swinging bars at points between the centres and corners of the same, and combining and arranging the pins or studs on the ends of the backs, and the pins or studs on the faces of the arm rests, or on the ends of the backs, in such relation to the bars and slots as to enable them to be suspended in the proper relation to the bottoms of the seats, to form the usual seats, or to be swung and extended, to form reclining or sleeping couches. 2d, The combination of the spring bars or catches, having studs at their ends and segmental slots, with the swinging seat bottoms.

303. COTTON GINS; Henry C. Parkhurst, City of New York.

Claim—Constructing the hoppers of cylinder cotton gins with the fixed end pieces and movable end pieces, on the breast board, attached by the joint.

304. HORSE RAKES; L. H. Parson and George Houston, Middletown, New York.

Claim—The arrangement and combination of the rake, toothed sector, toothed ring, supplemental springs, and clearers.

305. MACHINES FOR TIGHTENING AND SECURING METALLIC BANDS FOR COTTON BALES, &c.; George W. Penniston, North Vernon, Indiana.

Claim—The construction of my hoop tightener and holder, in connexion with doors, and arms, and lever, constructed as described.

306. OILING THE THREAD FOR SEWING MACHINES; Truman W. Pepper, City of New York.

Claim—The described improvement in oil vessels for sewing machines, namely, providing the vessel with the regulating plug, neck or spout, and porous material, over which the thread is drawn.

307. MACHINE FOR MAKING CHAIN; E. P. Perry, Providence, Rhode Island.

Claim—The combination of a separating die with the tube, wherein the chain is formed, for the purpose of permitting each link of the chain after it has been struck into form to be transmitted to the tube.

308. CORN HUSKERS; C. J. C. Peterson, Davenport, Iowa.

Claim—1st, The feeder. 2d, The butter. 3d, The husker. 4th, The farmer. 5th, The receiver, in combination with the farmer, husker, butter, and feeder, when these several parts are arranged to operate conjointly as described.

309. CARDING MACHINES; Charles E Price and James Haythorn, Thompsonville, Connecticut.

Claim—The spirally grooved or threaded cylinder, E, applied in the manner described, in combination with the doffer and comb, and with a tube.

310. CARPET FASTENER; Joseph Reynolds, New Britain, Connecticut.

Claim—The hook and plate in one piece, as described.

311. VALVE COCKS; J. R. and H. S. Robinson, Clinton, Massachusetts.

Claim—1st, The construction of the valve, whether in one or two pieces, valve spindle, and valve case, in the manner described, so as to make a straight passage through the valve, spindle, and case. 2d, Making the valve in two pieces, for the reasons specified. 3d, When the valve is so made, running the springs through the spindle, for the reasons specified.

312. STRAW CARRIERS OF THRESHING MACHINES; F. W. Robinson, Richmond, Indiana.

Claim—The combination of the perforated platform with the endless chain of slats.

313. SHUTTER OPERATORS; Isaac Rogers, Oswego, New York.

Claim—The lever, rod, crank, and slide, the whole being arranged on the shutter and window frame, as set forth

314. SHEARS; James H. Roome, City of New York.

Claim—The combination of the additional connecting rod, F, with the rod, D, and upper slotted handle, for enabling the leverage exerted by the thumb to be increased with the closing of the upper blade.

315. WINDOW FASTENER; Irving Root, Austin, Texas.

Claim—The plate and thimbles, the groove, the spring plate, and cylinder.

316. APPARATUS FOR PAYING OUT TELEGRAPH CABLE; George Scott, Wiscasset, Maine.

Claim—In combination with a delivering roller or a system of delivering rollers, a tilting lever, or its equivalent, and a brake mechanism, or any equivalent therefor, for arresting or controlling the revolution of the delivering roller or rollers, the whole being made to operate in such manner as to increase the paying out or delivery of the cable under increase of tension of it, as described. Also, when the lever is applied to a brake apparatus and a guide roller, essentially as described, combining the guide roller with it by means of a spring, or making the outer arm or the lever as a spring, for the purpose of enabling such spring to operate the lever, in manner and under circumstances as set forth. Also, combining the inertia weight with the spring lever, so as to cause such to operate, as specified, under a sudden upheaval of the stern of the vessel.

317. FARE BOXES FOR OMNIBUSES, &c.; I. B. Slawson, New Orleans, Louisiana.

Claim—1st, The arrangement of an opening in the top of the fare-box, through which outside passengers can deposit their fare, when such opening communicates with a chamber in which the fare first falls, and is temporarily arrested previous to being deposited in the receiving drawer beneath. 2d, The arrangement of the passage block and cover, over the opening in the top of the fare-box.

318. CLASPS FOR HOOP SKIRTS; A. Smart, City of New York.

Claim—A hoop clasp constructed with a longitudinal loop, substantially as described.

319. CHURN; John E. Smith, Galen, and Wrightman Brown, Rose, New York.

Claim—The combination and arrangement of the cylinder divided into two chambers by the partition, the close interior case, adjustable vane blower and regulator, refrigerating passage, and ventilators.

320. SEEDING MACHINES; Joseph D. Smith, Lancaster, Ohio.

Claim—The arrangement and combination of the spout, wheels, frame, H, and frame, D, as described.

321. FEET WARMING DEVICE; George W. Smith, Aurora, Indiana.

Claim—The employment or use of the chamber when applied to a forge, and heated by steam generated within a box, or its equivalent, by the force of the forge.

322. CULTIVATORS; Nathaniel S. Smith, Buffalo, New York.

Claim—The use of the double joint piece to connect the gang of hoes to the axle, when said joint piece extends beyond the axle, and subserves also the purpose of a foot lever to throw the hoes out of the ground.

323. PROPELLER FOR BOATS; Le Grand C. St. John, Buffalo, New York.

Claim—1st, The construction and use of a propeller case having three conduits arranged on parallel lines, so that the water will be received into the case through the outside conduits at the same stroke of the piston that water is discharged through the middle conduit, and vice versa. 2d, The arrangement of two revolving pistons with respect to an enclosing case, whether said case is made single or double, and the combination thereof with a boat, so that in the act of propelling, water will be received into the case at an orifice or channel, and discharged at another orifice or channel through the bottom of the boat. 3d, The construction of my revolving pistons, partly of wood and partly of iron.

324. MACHINE FOR CUTTING IRREGULAR FORMS; Henry D. Stover, Boston, Massachusetts.

Claim—1st, The guards and bar, carrying them combined with the revolving cutters and table, in the manner described. 2d, The guide, so constructed and fitted to the outer surface of the bearing or tube, as to be vertically adjustable thereon to guide the pattern without wearing it, while the piece secured to the pattern relieves the shape from the cutting knives immediately above. 3d, The combination of the adjustable elastic sleeve with the tube or bearing and guide, in the manner described. 4th, The slabbed spindle, collars, and the cutters, constructed and relatively arranged and operated in connexion with each other, essentially in the manner described.

325. ROLLING RAILWAY CHAIRS; James H. Swett, Pittsburgh, Pennsylvania.

Claim—The process of rolling railroad chairs, the cutting under or into the solid iron for the purpose of forming the jaw, after the bar is rolled and bent, and thus avoid the raising up and afterwards bending down of the part that is to form the jaw, as heretofore done.

326. BRACELETS; Francis M. Sweet, Syracuse, New York.

Claim—The employment of the elastic rubber or spring connexion between the two parts of the bracelet, operating substantially as described, and when the parts F and C are furnished with guides, in the manner set forth.

327. HAT BODY MACHINERY; Alva B. Taylor, Newark, New Jersey.

Claim—The combination of a disk picker operating with a perforated former. Also, a disk picker composed of two disks, whose faces are studded with teeth to pick fibrous material fed into the eye of the picker, and to discharge the picked fibre at the run thereof.

328. GRAIN SEPARATORS; John D. Tifft, Cuyahoga, Ohio.

Claim—The employment of a circular side valve, in combination with the directing board, when the parts are constructed and arranged as set forth.

329. TRAVELING CASKET; T. R. Timbey, Medina, New York.

Claim—Attaching the stiff sides of the traveling casket to the intermediate metal or other framing, by means of rubber or other springs.

330. Ox Yokes; George W. Weeks, Boston, Massachusetts.

Claim—Making ox bows and yokes of iron, or other suitable material, hollow.

331. Washing Machine; Thomas J. Tindall, City of New York.

Claim—Combining with a suitable vessel for containing the clothes, &c., to be washed, and the washing liquid, and the exhausting pump, or equivalent therefor, communicating with the said vessel above the intended charge, to exhaust the said vessel above the charge and relieve the pressure, to effect the circulation of the washing liquid by ebullition below the recognised boiling point.

332. Rolling and Piling Logs; Wm. Todd, Cherryfield, Maine.

Claim—The combination and arrangement of the tapered roller with the diagonally arranged cylindrical rollers, for facilitating and guiding the movements of logs and heavy timbers, and piling the same in ranks or on teams and vessels.

333. Apparatus for Roasting Coffee; Samuel Tower, Grand Rapids, Michigan.

Claim—Having a portion of each of the journals or axles attached to each sphere or shell, and otherwise arranged or combined, so that when the spheres or shells are closed, the axles or journals will be completed and the shells will be locked.

334. Bridge; L. E. Truesdell, Warren, Massachusetts.

Claim—1st, An iron bridge constructed with a series of horizontal chords, in combination with vertical standards and diagonal braces, or their equivalents. 2d, Constructing the clamp in the manner set forth.

335. Seeding Machines; Alexander Turner, Redden Bess, and Hervey Sloan, Franklin, Indiana.

Claim—The arrangement of the seed boxes, the seed slide, rod, wheels, and ploughs, in the manner specified.

336. Safety Valve and Pressure Gauge; James H. Winn, Portage, Wisconsin.

Claim—The weighted pendulous rods and suspended index, I, applied in relation with each other and with the dial, and combined with the piston valve by means of a sector, chain, and rod, or their equivalents.

337. Attaching the Prop of Carriage Bows; D. B. Wright and L. Sawyer, South Amesbury, Massachusetts.

Claim—A carriage prop in which the prop, C, is rendered independent of its plate.

338. Corn Planters; Franklin W. White, Worcester, Massachusetts.

Claim—Operating the seed slides through the rod and its arm, and the hole or holes in the wheel. Also, in combination with a dropping apparatus and the double mould-boards for opening the furrow, the openings and guides, for admitting and directing the earth or soil that is to cover the seed.

339. Trace Fastening; John C. De Witt, West Bloomfield, Assignor to self and Terah Benedict, Newark, New Jersey.

Claim—The frame or body provided with the tongue projecting from it at right angles, when the frame or body is connected with the plates of the tug, by means of the pivots of said plate fitting in oblong slots in the sides of the frame or body, so that the same may be shoved forward and backward to admit of its being locked, and also of being opened.

340. Inkstands; V. Fogerty, Cambridgeport, Assignor to Francis Houghton, Somerville, Massachusetts.

Claim—In combination with an inkstand or ink-reservoir and its mouth, a dipper or vessel so applied within said reservoir as to be capable of being within it, and towards and away from said mouth, for the purpose of taking up ink or a liquid from the reservoir. Also, the application of the dipper to the movable cap of the mouth of the reservoir, so as to be operated by the said cap.

341. Knitting Machines; Thomas Lovelidge, Assignor to self and Wm. Tulfirth, Germantown, Penna.

Claim—The pressure plate situated between the two rows of thread guides, and operated so as to press the loops down the needles.

342. Seed Planters; W. A. Mahaffy, Carimona, Minnesota, Assignor to John Greek, Evansville, Ind.

Claim—The seed slides, in combination with the wheels or cylinders, arranged for joint action, as set forth.

343. Regulating the Tension of the Thread in Sewing Machines; John T. B. Rogers, City of New York, Assignor to George B. Sloat, Philadelphia, Pennsylvania.

Claim—The combination of the cone and conical cap, for the purposes set forth.

344. Cut-off for Steam Engines; Jacob Windmer, Assignor to self and Howard Gilbert, New Haven, Conn.

Claim—The combination of the bevel gear pinion, operated by the endless chain and rod, with the bevel gear wheel with its cam.

Re-Issues.

1. Continuous Sheet Metal Lathing Surface; John B. Cornell, City of New York; patented May 13, 1856; re-issued August 3, 1858.

Claim—A closely united plaster, supporting metallic surface of substantially the shape described, when used in the construction of partitions, &c., which are designed to be fire-proof and burglar-proof.

2. Omnibus Fare-box; I. S. Reeves, Assignor to J. B. Slawson, New Orleans, Louisiana; patented February 23, 1858; re-issued August 3, 1858.

Claim—1st, The glass plates, as arranged in connexion with the apron, in the manner set forth. 2d, Closing the passage to the drawer below from the chamber above by means of an apron operated by a spring, in the manner as set forth.

3. Reaping Machines; C. H. McCormick, Chicago, Illinois; patented January 31, 1845; re-issued August 3, 1858.

Claim—The employment of the projecting ends of the reel ribs to effect the separation of the grain to be cut from that to be left standing, in combination with a dividing apparatus which effects a division of the grain to be cut from that to be left standing, by forming an open space between the outer and inner grain for the ends of the ribs of the reel to act in, in which open space there is no reel post or other obstruction to prevent the free passage of the grain as it is brought back by the ends of the reel ribs to the platform of the machine, and by which means a separation of the inside grain to be cut from the outside grain to be left standing is made complete by the action and power of the reel.

4. REAPING MACHINES; C. H. McCormick, Chicago, Illinois; patented January 31, 1845; re-issued August 3, 1858.

Claim—The downward curve or bend of the beams that support the cutting apparatus to facilitate the discharge of any clogging matter that may enter.

5. KNIFE POLISHERS; W. H. Horstman, City of New York, Assignee of Reuben Shaler, Madison, Connecticut; patented Nov. 28, 1848; re-issued August 10, 1858.

Claim—The combination of the hopper, polishing surface, and spring, or their equivalents.

6. PRINTING PRESS; George P. Gordon, City of New York; patented January 1, 1858; re-issued August 10, 1858.

Claim—1st. The arrangement and combination of a rotating disk, w, with an annular ring or outside disk, x, the two revolving each in an opposite direction to the other, for the purpose of breaking up the ink, so that it shall by such contrary motions become evenly distributed, and thus imparted to the rollers which ink the form of types. 2d. Moving the rollers, "one or more being used," for inking the form from the parallel position they necessarily assume, for this purpose changing to an oblique position, which shall give to them a lateral motion, when in contact with the distributing disks, or some equivalent. 3d. The arrangement of a form bed, which alternately varies its motion during its reciprocating movement, viz: first traveling under and in contact with a cylinder to give an impression, then being withdrawn from contact with the cylinder, and remaining withdrawn during the re-movement to prevent an impression, such bed reciprocating and at the same time alternating from one of these positions to the other; thus performing two separate and distinct motions, entirely independent of, and in contrary direction to, each other, while remaining in gear with the cylinder, when such bed shall be used with a cylinder, or its equivalent, having a part revolution with a reciprocating movement. 4th. Attaching to the reciprocating form or type bed, an adjustable rack as well as a stationary rack, which two racks shall play into gear, upon a cylinder or segment of a cylinder, so that any and all wear or variation may at once be taken up by adjusting the movable rack, and by this means always cause the bed and cylinder or segment of a cylinder to work in harmony with each other, and produce a clear and sharp impression free from slur. 5th. I do not claim placing a reciprocating bed in a vertical position, or any given angle from a horizontal position—but I claim so placing the bed when used with a rotating reciprocating cylinder or segment of a cylinder, which shall place or pile the sheets of printed paper upon the fly-board.

7. TURNING AND SLIDING TABLES FOR RAILROADS; Wm. Sellers, Philadelphia, Pennsylvania; patented March 23, 1858; re-issued August 10, 1858.

Claim—Interposing the central part or box between the ends of the truss rail beams, in such manner as to make use of the width of said central part or box as a portion of the length of said beams—when the said beams and central box are so constructed and connected as to form a table entirely supported from the central part or box.

8. COFFEE POTS; Charles B. Waite and Joseph W. Sener, Fredericksburg, Virginia; patented April 22, 1856; re-issued August 10, 1858.

Claim—The arrangement whereby the steam from the boiler is discharged into the water in the condenser, which absorbs the aroma, in combination with the syphon for returning the contents of the condenser into the boiler.

9. SURFACE CONDENSERS FOR STEAM ENGINES; J. P. Pirsson, City of New York; patented April 2, 1850; re-issued August 10, 1858.

Claim—1st, So enclosing the condensing surfaces of a surface condenser, within a tank which is constructed to be capable of acting as a jet condenser, that when the said surface condenser shall become deranged by breaks or otherwise, resort may be had to the jet condenser, whereby condensation may be continued and the vacuum maintained. 2d. The combination of a surface condenser with a box or case, in such manner that the condensation of the steam shall be effected therein without subjecting the said surface condenser to atmospheric pressure. 3d. The aperture, w, or its equivalent, for maintaining the vacuum, and as a passage for any steam which may remain uncondensed in the radiating condenser. 4th. Connecting the evaporator with the chamber, *h*, substantially in the manner described, whereby the saturated water can be drawn off from the bottom of the evaporator.

10. SKIRT HOOPS; David Holmes, Westfield, Massachusetts; patented June 15, 1858; re-issued Aug. 17, 1858.

Claim—1st, Connecting the hoops to each other by a series of loops. 2d, Attaching to the hoops the tapes or other articles by which the hoops are suspended, by means of metallic clasps which embrace the hoops. 3d, Forming eyes in the braiding at the extremity of the hoops to serve as a slide.

11. WATCH CASES; W. E. Baldwin and E. Bliss, Newark, New Jersey, Assignees of John F. Watson, St. John's Square, Clerkenwell, England; patented April 13, 1858; re-issued August 17, 1858; patented in England, June 16. 1857.

Claim—Reversing the inner case containing the works and dial in the outer case to present the dial on either side. Also, pivoting the inner case containing the works and the dial to the ring of the outer case, or by equivalent means, so that it can be reversed to present the dial in either direction without disconnecting it from the outer case.

12. WATCH CASES; W. E. Baldwin and E. Bliss, Newark, New Jersey, Assignees of John F. Watson, St. John's Square, Clerkenwell, England; patented in England, June 16, 1857; patented April 13, 1858; re-issued August 17, 1858.

Claim—1st, Attaching a pendant in double case watches permanently to the ring of the outer case. 2d, Connecting the inner case with the ring of the outer case, so that the inner case containing the works on dial can be reversed and held within the ring of the outer case to exhibit either the back or the dial through the bizzle, and so that the inner case may be held in the ring of the outer case independently of the closing of the outer case. 3d, In reversing the inner case containing the works and dial in the outer case to present the dial on either side, I claim shifting the dial one quarter of a circle, or by equivalent means, so that the figures of the dial may be properly located relatively to the pendant for either the ordinary open face watch, or the ordinary hunting watch. 4th. Forming the ring of the inner case with a flanch or rib, in combination with a corresponding flanch, rib, or rest on the ring of the outer case, to give the required support to the inner case within the outer case when reversed, to present the dial in either direction.

13. MANUFACTURE OF HARD RUBBER GOODS; Gustavus Cuppers, College Point, New York; patented July 20, 1858; re-issued August 24, 1858

Claim—The improvements in the hardening and vulcanizing of india rubber or gutta-percha, by which the manufacture of perfectly shaped articles may be facilitated.

14. PUMPS; Hosea Lindsey, Ashville, North Carolina; patented Dec. 4, 1855; re-issued Aug. 24, 1858.

Claim—1st. The combination and arrangement of the vertical central conducting pipe, horizontal double chambered or double valved-receiving and supplying cylinder, two alternately reciprocating pistons or plungers, and piston connecting and guide rods. 2d, Effecting the reciprocation of the piston or pistons, by means of a curved inclined plane, arranged horizontally on the bottom of the well.

15. HARVESTERS; N. Platt, formerly of Ottawa, Illinois, Assignor to W. H. Seymour and D. S. Morgan, Brockport, New York; patented June 12, 1849; re-issued May 23, 1854; re-re-issued Aug. 31, 1858.

Claim—1st, Combining with a machine for cutting grain and gathering it upon a platform, a raking mechanism which at suitable intervals sweeps the grain off the platform, changes the direction of its stalks relative to the path of the machine, and discharges it upon the ground in gavels. 2d, The employment of a sweep or vibrating rake, operating in such manner that while sweeping the grain off the platform and discharging it upon the ground it will change the direction of the stalks. 3d, The method of vibrating a sweep rake, and turning its teeth in such manner that they will pass over the grain points foremost at intervals to reach back and seize the grain and sweep it off the platform. 4th, The method of holding a sweep rake firmly, while raking the grain with the points of its teeth, in the proper position relative to the platform, by means of a latch, or other equivalent thereto, which operating with a greater certainty than a weight, spring, or other fastening not rigid, more effectually prevents the rake teeth from rising to override the grain, and at the same time avoids the necessity of moving a heavy weight, or of overcoming the tension of a strong spring, in elevating the rake preparatory to its retrograde stroke. 5th, The construction and arrangement of a sweep rake and the mechanism for operating it, in such manner that it is carried back and forth, and its teeth raised and lowered without support at the outer end. 6th, Changing the frequency of the alternations of the raking mechanism, by means of the shifting gear, or other equivalent devices, for producing a varying rate of motion for the purpose of varying the size of the sheaves as may be required.

16. HARVESTERS; N. Platt, formerly of Ottawa, Illinois, Assignor to W H. Seymour and D. S. Morgan, Brockport, New York; patented June 12, 1849: re-issued May 23, 1854; re-re-issued Aug. 31, 1858.

Claim—The combination of the vibrating sweep rake with the lever carrying the same, vibrated by gearing located within the inner edge or circle of said platform, as set forth.

17. HARVESTERS; N. Platt, formerly of Ottawa, Illinois, Assignor to W. H. Seymour and D. S. Morgan, Brockport, New York; patented June 12, 1849; re-issued May 23, 1854; re-re-issued Aug. 31, 1858.

Claim—Constructing that portion of the platform of the reaping machine which is traversed by a rake working above it, with a solid floor so shaped as to allow the points of the teeth of the rake to move below the plane traversed by the grain, substantially as set forth.

18. HARVESTERS; N. Platt, formerly of Ottawa, Illinois, Assignor to W. H. Seymour and D. S. Morgan, Brockport, New York; patented June 12, 1849; re-issued May 23, 1854; re-re-issued Aug. 31, 1858.

Claim—The combination of a vibrating sweep rake with a fence or guard, to prevent the grain from being deflected from the path of the rake by centrifugal force, substantially as set forth.

19. STEAM BOILERS; F. P. Dimpfel, Philadelphia, Pennsylvania; patented April 1, 1856; re-issued August 31, 1858.

Claim—The arrangement of the tubes, and the connexion of one or more receptacles for consuming the fine particles of coal which are carried by the force of the blast or draft from the fire chamber into the flues, the said receptacle being placed below the bottom of the main flue, and communicating therewith, and between the fire chamber and a check or deflector, or between checks and deflectors in the main flue, to check the momentum of the particles of coal, and cause them to drop into the receptacle to be consumed. Also, in the construction of the boiler forming a single flue in the middle, for the passage of the products of combustion from the main flues surrounding the water tubes to the smoke box, when this is connected with a check or deflector placed in the main tube, among the water tubes and in front of the said middle flue, to prevent the products of combustion from taking a direct course to the said middle flue. Also, arranging the bent up ends of the water tubes where they are connected with the crown sheet of the furnace, in a series of double longitudinal rows, and leaving spaces between the double rows of greater width than the external diameter of the water tubes, to admit of taking out and inserting the tubes, whilst in other respects the said tubes may be placed as near to each other as may be desired. Also, interposing the net-work or plate between the rear end of the flue and the smoke-stack, and the exhaust pipe. Also, combining with the deflector in the smoke box the receptacle for the sparks or fine particles of coal dust, for preventing the sparks from being consumed or accumulating in the smoke box, and interfering with the draft.

20. MANUFACTURE OF TEXTILE HOSE; L. B. Cooley and James C. Cooke, Assignors to Linus B. Cooley, S. Babcock, and B. G. Cooley, Middletown, Connecticut; patented March 16, 1858; re-issued Aug. 31, 1858.

Claim—The double tube or hose, woven in the manner specified, and this we claim whether used for hose belting, card clothing, shoe soles, harness pads, and traces, or any other purpose.

DESIGNS.

1. CAN COVERS; John F. Bodine, Assignor to self, Wm. H. and J. Alfred Bodine, Williamstown, New Jersey; dated August 3, 1858.

2. COOKING STOVES; R. Ham, Assignor to Smith, Sheldon & Co., Troy, New York; dated August 3, 1858.

3. TOWEL STANDS; Nathaniel Waterman, Boston, Massachusetts; dated August 3, 1858.

4. PRINTERS' TYPES; George Bruce, City of New York; dated August 10, 1858.

5. DOOR LOCK PLATES; Cornelius B. Erwin, New Britain, Connecticut; dated August 10, 1858; two cases.

6. DOOR LOCK PLATES; Henry E. Russell, New Britain, Connecticut; dated August 10, 1858.

7. BOX STOVES; N. S. Vedder and Henry Ripley, Assignor to N. S. Vedder, aforesaid, Troy, New York; dated August 10, 1858.

8. COOKING STOVES; N. S. Vedder, Troy, New York; dated August 10, 1858.

9. PARLOR STOVES; N. S. Vedder, Troy, New York; dated August 10. 1858; two cases.

10. STOVES; Jacob Steffe, James Horton, and John Currie, Assignors to David Stewart and Richard Peterson, Philadelphia, Pennsylvania; dated August 17, 1858; two cases.

11 ROLL PANS; Nathaniel Waterman, Boston, Massachusetts; dated August 17, 1858.

12. COOKING STOVE; Wm. P. Abendroth, Rochester, New York; dated August 31, 1858.

13. SCREENS; James L. Jackson, City of New York; dated August 31, 1858.

14. BREAD PANS; Nathaniel Waterman, Boston, Massachusetts; dated August 31, 1858.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

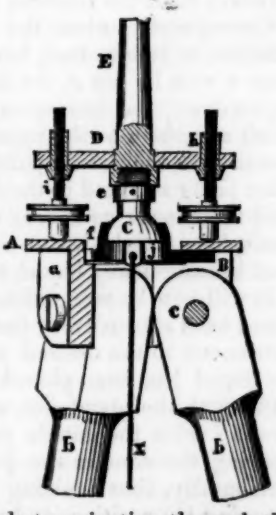
FROM H. HOWSON'S PATENT AGENCY, PHILADELPHIA.

For the Journal of the Franklin Institute.

Improvements in Surveyors' Tripods. Patent granted to W. J. YOUNG, Philadelphia, July 13th, 1858.

This invention relates to improvements in the heads of tripods used by surveyors in connexion with theodolites and other instruments, and the invention consists in so constructing the said heads, that the upper portion of the same to which the instrument and plumb-rule are attached, shall be separate from, and adjustable longitudinally to, the lower portion, to which the legs are jointed; the usual leveling screws being used as a means of binding the above mentioned portions of the head together after adjustment.

The object of the invention is to dispense with the usual process of moving and depressing one or other of the legs in order to bring the plumb-line to the desired position.



The annexed cut represents a sectional view of Mr. Young's improved tripod head.

The lower portion of the head consists of an annular plate A, from which project six flanches *a*. These combined, form three recesses for the upper end of the legs *b*, which are hung to pins *c*, attached to the flanches *a*.

The upper portion of the head consists of the circular plate D, to the centre of which is secured the pin E, for receiving the theodolite or other instrument.

To the pin E, on the underside of the plate D, is secured the end of the stem *e*, which projects from and forms a part of the hemisphere C, the latter fitting into the concave socket *f*, on the plate B, this socket projecting through the central opening in the annular plate A of the lower portion of the head. The plate B consists of three plain projections, each of which bears against the underside of the annular plate A, in one of the recesses formed by two of the flanches *a*.

Four nuts *h*, are secured to the plate D, and into these nuts screw the ends of the leveling screws *i*, the lower ends of which bear on the surface of the plate A, the screws being furnished with the usual disks with milled edges so as to be easily turned by the finger and thumb of the operator.

The plumb-line is attached to a pin *j*, which projects from the underside of the hemisphere *c*. As far as regards the upper plate D with its pin E, the hemispherical coupling and leveling screws *i*, the arrangement is similar in construction and operation to that of tripod heads in common use. The socket *f*, however, has hitherto either formed a permanent portion of that part of the head attached directly to the legs or a portion of a plate rendered adjustable horizontally by means of screws independent of those used for leveling purposes. If arranged in the former plan, the operator must resort to the usual tedious process of moving in or out one or other of the legs *b*, or depressing the same before he can bring the plumb-line to coincide with a given point in the ground. Should the latter be of a stony nature, the difficulty and delay attending the adjustment would be increased. The method of adjusting the upper portion of the head by means of horizontal slides and screws, a plan sometimes resorted to, requires a manipulation almost as tedious as that above described.

In Mr. Young's improved tripod head, the opening in the plate A, is larger in diameter than the socket *f*, which projects through the opening, and each of the three projections which form the plate B is narrower than the recesses formed by the flanches *a*.

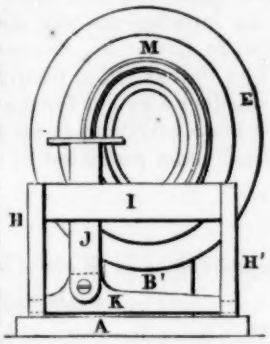
Consequently, when the leveling screws *i* are turned to an extent sufficient to relieve their lower ends from contact with the plate A, the plate D with its pin E, the instrument attached to the latter, the leveling screws I, the hemisphere C, its plumb-line, and the plate B, all of which appertain to the upper portion of the head, may be moved horizontally on the lower portion in any direction to a limited extent. After being adjusted to the desired position, the screws *i* may be turned until their lower ends bear on the surface of the plate A, and force the hemisphere C tight within its socket F, when the two portions of the head become firmly bound together.

It will now be seen, without further description, that the improved tripod head affords every facility for a rapid and exact adjustment of the instrument to the desired position by the hand of the surveyor, after the tripod has been placed in proximity to the point in the ground, with which the plumb-line must coincide. It will also be seen that the screws *i* serve the double purpose of leveling the instrument, and of securing the same in the position to which it may have been adjusted horizontally, thus enabling the operator to perform two duties without changing his position, and without the usual handling of different portions of the tripod.

Machine for Preparing Oval Picture Frames. Patent granted to WILLIAM GARDNER, New York, August 17th, 1858.

This invention relates to an improved mode of laying on to the wooden bodies of oval and circular picture frames, the coats of cement necessary to form the ground-work for the gilding; and the improvement consists in the combination of a lathe, the face plate of which is

caused to traverse in an oval path with a scraper formed to coincide with the desired moulding of the frame, the said scraper being self-adjusting laterally, so that it may accommodate itself to any irregular motion of the frame caused by the latter being placed between the intervals allowed for the drying of the several coats of cement in such a position on the face-plate of the lathe as not to coincide with the oval path of the latter.



On reference to the annexed cut, A represents the base of the machine, to which are secured uprights B for the spindle. E is the face plate connected with the spindle by such devices that it may revolve in an oval path. In front of the face plate, and at a suitable distance from the same, are erected the two uprights H and H′, which are connected together at the top by the transverse bar I. Between the latter is situated an arm J, which is jointed at the bottom to the rock-shaft K, the ends of which are allowed to turn freely in the opposite uprights H and H′. The top of the arm J is furnished with a thin metal plate, one edge of which is so cut out as to coincide with the form of the moulding of the frame M, the latter being attached to the face plate E.

The term "*preparing*" as applied to picture frames by those engaged in their manufacture, signifies the covering of the wooden body or foundation with the coatings of cement for forming the ground work for the gilding.

The preparation of oval picture frames has hitherto been accomplished by hand, the coats of cement being laid on at intervals of sufficient length to allow them to dry between each coat. When a sufficient body of cement has been laid on, it is polished with pumice stone until the desired smoothness is imparted to the surface, when it is ready to receive the gilding.

In Gardner's improved machine, the frame is temporarily attached to the face plate E, the cement applied to the moulding, and the scraper pressed towards it.

When one coat has been laid on, the frame is removed until partially dry, when it is again attached to the face plate to receive another coat and another application of the scraper, and this is continued until the required amount of cement is deposited on the frame, and the required smoothness attained.

In re-attaching the frame to the face plate after the several intervals allowed for drying, it is almost impossible to place it in the exact position it previously occupied; hence, the plan of securing the scraper to the vibrating arm J, which renders the scraper self-adjusting laterally to any irregularity in the movement of the frame.

By the above described machine, oval picture frames are prepared with that rapidity, uniformity, and accuracy which cannot possibly be attained by the ordinary process of preparing them by hand.

NOTE.—The right to this invention formed a subject of controversy between Mr. Gardner and Mr. J. A. Campbell, who also claimed to be the original and first inventor.

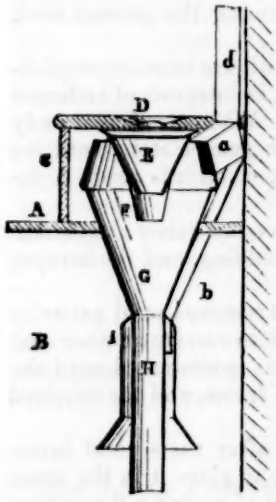
An interference was declared by the Patent Office, and testimony taken at Louisville, Kentucky, and in New York.

The Patent Office finally decided to grant patents to both parties; to Gardner a patent for the broad claim of a self-adjusting scraper with face plate revolving in an oval path; and to Campbell, a patent for a limited claim restricted to a specific arrangement of parts. H. H.

Improvement in Water-Closets. Patent granted to ISAAC EDELMAN, Philadelphia, September 1st, 1858.

This invention consists in surrounding the pipe which contains the basin with a casing attached to and communicating with a pipe or flue, and this flue with an exterior atmosphere, for the purpose of effectually ventilating the soil pipe and the well for receiving the soil, thereby obviating the offensive smells and noxious exhalations common to other water closets, and without the necessity of employing the usual valve beneath the basin.

The annexed cut represents a sectional view of the improved water-closet. A represents the floor of the apartment in which the closet is situated, and B the well which serves as a reservoir for the soil.



On the floor is erected a box C, in the cover of which is the usual opening D. Immediately beneath the latter is situated the basin E of porcelain or other material usually employed in their construction. This basin rests in the enlarged portion of the tapering pipe F, which is secured to the top of the casing C, and which projects into and communicates with the interior of that casing, to the small end of which is attached the soil pipe H, surrounded by a pipe I which is attached to the casing G, and which, together with the soil pipe, terminates in the well B. A branch pipe *a* communicates with the interior of the casing G, at a point near the top of the same, and to this branch is connected a ventilating pipe *d*, which may either be carried up to a suitable height outside the building, or it may communicate with a neighboring chimney or flue connected therewith. The space between the soil pipe H and exterior pipe I, also communicates with the branch *a* through a pipe *b*.

After the basin has been cleansed in the usual manner by a stream of water discharged from a coiled pipe, portions of the soil are apt to adhere to the soil pipe H, which but for the improved ventilating ar-

rangement would impregnate the air of the apartments in the neighborhood of the closet with offensive gases.

The rarefied air in the neighborhood of the closet, however, will pass down the basin and pipe F, into the casing G, and upwards through the branch *a* to the ventilating pipe or flue, the foul air from the soil pipe passing upward into the same casing and out in the same direction.

The peculiar form of the casing G, and its position as regards the pipe F, branch pipe A, and soil pipe H, facilitates the free discharge of all noxious exhalations through the ventilating pipe into the exterior atmosphere.

In order to avoid all offensive effluvia, it is necessary that the well which forms a reservoir for the soil should be effectually ventilated.

This is accomplished by the above described arrangement, as the foul gases generated in the well pass into the space between the soil pipe H and exterior pipe I, and from them to the ventilating pipe or flue through the pipe *b*.

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Corrections of Mr. Pirsson's Article "On the Durability of Tubes" in his Condenser. By THOMAS PROSSER, Civ. Eng.

In the current volume of this *Journal*, p. 234, Mr. Pirsson has entered upon a defence of his surface condenser, and a condemnation of *all* others, which, as mere assertions, may pass for what they are worth, unsupported as they are by any specific references.

This might not be expected from the caption of the article, but so it is, and the only exception I take, is the very debatable elaboration on surface condensers in general, and the fanciful assumption which follows.

"*Until the advent of my invention*," says the writer of the article alluded to, "want of durability in surface condensers had been the chief objection to their use;" caused by "pressure, and expansion, and contraction."

This assertion is not warranted by any single instance that I know of, in any condenser worthy of one moment's consideration. Hall's were put into a great number of vessels, and were highly extolled for years; but where are they now? I am not ignorant of the array which Mr. Pirsson can produce in favor of his condenser, but it is far inferior to Mr. Hall's, and yet, notwithstanding the almost perfect vacuum which they maintained, thereby proving that "pressure, and contraction, and expansion" had no injurious effect, and further, that they had no provision for returning to "*jet condensation*," (which "new feature" only proves to me the defective nature of the arrangement, and that it is not to be depended on,) that condenser was a failure; not from "pressure, and expansion, and contraction," but from defects inherent

in the system or principle of air pump surface condensation, which I have pointed out in former volumes of this *Journal*, and to which I invite the attention of Mr. Pirsson, with the view to the correction of any errors which he may find there.

I can name other surface condensers to which the assertion that, the "new feature upon which only may surface condensation be safely employed," does not apply, if, indeed, it does to any.

"When the tubes do give out,"—"the only difference perceivable in the working of the engine is the loss of fresh water." Exactly so; I do not see what else can happen. The condenser being for the express purpose of securing a supply of *fresh water*, when it fails, I suppose there is still the sea-water to go to. I did suppose that the additional air-pump was required on account of the extreme thinness of the tubes employed, not being able to bear the pressure of the atmosphere, but such thin tubes having failed, and thicker ones being substituted for them, I expected that the *extra* air-pump might be dispensed with, particularly as one air-pump is always troublesome enough without increasing the evil. This, however, as it appears, is not the case, and I can only imagine that it arises from the continual liability of the tubes to leak the salt water into them. If this is the case, the vacuum may well be very inferior to that which Mr. Hall's condensers maintained, and shows conclusively the value of the "*new feature;*" for the latter is recorded at 28·5 to 29·5 inches,* which exceeds any that I have seen of the former by more than 4 inches.†

It is but natural, therefore, to inquire if the waters in the boilers are ever fresh after they have consumed the supply with which they leave port? To come more directly to the point; is it, or is it not necessary to pump about 25 ℔ cent. of sea-water into the boilers to make up for waste? which waste, the patent states, is to be made up by means of an "*evaporator.*" In short, is not the "*evaporator*" a delusion? If the vapor taken from the sea-water, causes concentration in the latter, of course the "blowing off" must be resorted to, just the same as if the concentration took place in the boiler.

The original evil is the necessity of "blowing off" at all, and that has killed and will kill every surface condenser that can be constructed with an air-pump attachment.

Upon this and other important points I shall be pleased to hear from Mr. Pirsson again, but as to the minor one, about the tinning, which were mentioned incidentally and scarcely worth the trouble of noticing, (to the exclusion of the main principles involved, economy of fuel and freshness of boiler water, which are so closely connected as to be inseparable,) further developments are required.

On the durability of copper tubes, Mr. Pirsson states that "the copper tubes at present in the condenser of the *Arago* are now (September 19th,) far in the fourth year of their existence." "The same in the case of the *Fulton!*"

Now, if my statements are erroneous, I may have a good excuse for them, in the absence of published documents of authority, but Mr. Pirsson can claim no such immunity.

* Lond. Mec. Mag., vol. xxxii, p. 27. † See vol. xxviii, p. 340, of this Journal.

The *Arago* did not commence her first voyage until 3d June, 1855,* since which time she has had a set of copper tubes put into her condensers other than those she started with, as Mr. Pirsson acknowledges. I do not perceive, therefore, that any of my statements have been corrected, except to show that the case is worse than I made it out to be.

The *Fulton* has not been to sea as long as the *Arago*, and it was not intended to put her condensers in until after the third voyage,† so that she can scarcely have been much, if any, over two years with the condensers on board.

I shall pursue the correction of Mr. Pirsson no further, but hope he will set himself right in the matter, give dates, &c., and address himself fully and fairly to the subject. A few more facts and we shall get out all that is required.

Certainly it is worth knowing, that Lake Superior copper is so utterly worthless as he represents it to be. It was supposed, however, that the tubes in the *Arago* were very thin, and that the new ones were made thicker, which may have something to do with the matter. At all events, the quality of the copper should undergo a severe scrutiny, and if inferior, it behooves the smelter to introduce more skilful manipulation.

From the manner of Mr. Pirsson, in speaking of condensers known to be leaky, I presume that he considers *that* to be the normal state of them, and I cannot but admire his ingenuity in thus getting over the old "*fogies*," who were used to consider "*tightness*" rather an essential feature in a condenser.

Mode of Preparing Liquids of given Specific Gravity, without Calculation or Previous Trials. Densimeter by M. SPACOWSKY.

In the laboratory and in the arts, we are often required to prepare a definite mixture of two liquids, such as sulphuric acid and water, alcohol and water, &c., one of two modes is generally employed. 1st, Given the quantity and specific gravity of one of the liquids, the quantity of the other liquid is calculated. This mode is not always practicable, requires time, and for alcoholic liquids especially, the concentration or mixture gives rise to difficulties frequently insurmountable; or secondly, areometers are floated in the liquors; but this means, which is very practicable and very much used, presents great difficulties in manufacture, owing to the various temperature of the mixtures.

A densimeter of a new form constructed by M. Spacowsky, of St. Petersburg, allows the preparation of a liquid mixture with great ease and precision, and without a thermometer.

The apparatus consists of a vessel or areometer of platina. This areometer is closed above by a very thin partition or metallic plate, such as that employed in the aneroid barometers and yielding to the fullest pressure. At its lower end the areometer is terminated by a tube fur-

* See vol. xxx, 3d series of this Journal. † Ibid vol. xxxi, p. 341.

nished with a stop-cock. It is suspended by a platina wire from one arm of a delicate balance, and equilibriated by a weight suspended also by a platina wire from the other arm. The equilibrium thus established will evidently be destroyed if the areometer be filled with any liquid, but will be restored if the areometer and the counter-balancing weight be plunged in a liquid of the same specific gravity as that which it contains; and as the thin partition allows the liquid contained to expand in accordance with the temperature to which it may be subjected, a very simple calculation will show that the re-establishment of the equilibrium is independent of the temperature. As, moreover, the metal of which the instrument is made, is very thin and a good conductor of heat, the equilibrium of temperature will soon be established between the interior and exterior liquid.

Now, to reproduce in any quantity, a liquid of given specific gravity; fill the areometer with the given liquid, and plunge it and the equilibriating weight into the heavier of the liquids to be mixed, and add the other until the equilibrium is restored. The liquids will be rigorously of the same specific gravity.—*Academie des Sciences de Paris, 7 June*, 1858.

For the Journal of the Franklin Institute.

Particulars of the North German Lloyds' Steamers Bremen and New York.

Hulls and machinery by Caird & Co., Greenwich. Intended service, Bremen to New York.

HULL.—

Length on deck from fore part of stem to after part of stern post,	328 feet.	
Breadth of beam at midship section, above the main wales,	40 "	2 inches.
Depth of hold,	26 "	
" " to spar deck,	33 "	
Draft of water at load line,	21 "	
" " below pressure and revolutions,	20 "	
Tonnage, 2500.		
Masts and rig—barque.		

ENGINES—Vertical direct.

Diameters of cylinders,		90 inches.
Length of stroke,	3 feet	6 "
Maximum pressure of steam in pounds, 25.		
" revolutions per minute, 50.		

BOILERS—Four—Horizontal tubular.

PROPELLERS.—

Diameter of screw,	17 feet.
Pitch "	30 to 33 "
Number of blades—three.	

Remarks.—Frames, shape and dimensions, ⌐, 6×$\frac{11}{16}$ths. Distance apart, at centres, 18 inches. Keel, 11×3$\frac{1}{4}$ inches. Plates, thickness, $\frac{3}{8}$ to $\frac{13}{32}$th inch. 6 keelsons, 30×$\frac{3}{4}$-inch. 5 water-tight bulkheads. Beam ties on each deck, 12×$\frac{1}{2}$-inch. Frame ties, 2$\frac{1}{2}$×$\frac{3}{4}$, and 12 ins. apart.

C. H. H.

For the Journal of the Franklin Institute.

Particulars of the North German Lloyds' Steamers Hudson and Weser.

Hulls and machinery by Palmer Brothers & Co., New York. Intended service, New York and Bremen.

HULL.—

Length on deck from fore part of stem to after part of stern post, above spar deck,	345 feet.	
" of deck,	318 "	
Breadth of beam at midship section, above the main wales,	40 "	
Depth of hold,	26 "	
" " to spar deck,	33 "	3 inches.
Diameter of shaft,		16 "
Length "	125 "	
Draft of water at load line,	22 "	
" below pressure and revolutions,	20 "	
Tonnage, 2703.		
Masts and rig—barque.		

ENGINES—Vertical, direct.

Diameter of cylinders,		90 inches.
Length of stroke,	3 feet	6 "
Maximum pressure of steam in pounds, 24.		
" revolutions per minute, 50.		

BOILERS—Four—Horizontal tubular.

Number of furnaces—eight to each boiler.

PROPELLERS.—

Diameter of screw,	16 feet	6 inches.
Pitch "	29 "	
Number of blades—three.		

Remarks.—Frames, shape and dimensions, ⌐, 6 inches × $\frac{1}{2}$-inch. Distance apart, at centres, 19 inches. Thickness of plates, $\frac{5}{8}$ to $\frac{7}{8}$-in. Have 5 water-tight bulkheads. Beam ties on each deck of wrought iron. Has accommodations for 70 first class, 100 second class, and 450 steerage passengers. C. H. H.

On Personal Equation. By Prof. MITCHEL.

[Letter to the Astronomer Royal.]

At the meeting of the American Association of 1856, I announced the fact that I had contrived a simple apparatus for the investigation of the subject of "*absolute* personal equation." Sickness in my family, and other causes, have combined to prevent a full investigation of this subject until the beginning of the present year.

In case a star could be made to record the moment of its own transit, the difference between the star's record and that of any observer would be the observer's *absolute* personal equation, or what I shall term hereafter, the "personality of the eye." In like manner, in case a sound could be made to record the moment of its occurrence, the difference

between the record and that of an observer would give what I term "absolute personality of the ear." The same of the sense of touch, which, as a matter of physiological curiosity, has somewhat engaged my attention.

As the stars cannot at present be made to record their own transits, I have substituted what I call "artificial stars," moving uniformly with a velocity somewhat greater than that of an equatorial star observed with a power of 200, the power of the eye-piece now used in the transit telescope. By means of an electro-magnet, these artificial stars (ten in number) attached to my revolving disk, are made to record the exact moment at which they transit an artificial meridian line. The observer, by the aid of another magnet, records the moment of his observed transit, and the difference of these two records corrected for difference of armature and gross time of the two magnets, gives me the "absolute personality of eye."

This same quantity has been obtained also from a record of the moment at which the eye perceives a white "stripe" on a dark ground, thrown into view by the sudden action of the electro-magnetic armature, which records the moment of transit of the artificial stars. These quantities, as will be seen hereafter, are almost identical.

To obtain "absolute personality of the ear," the observer, with his magnetic key, attempts to record the moment he perceives the sound produced by the fall of the "time-pen" on the disk, as driven by the armature of the time electro-magnet, it falls, and makes its "true" dot. The interval between the dot struck by the time-pen and that struck by the observer's recording pen, corrected for value of armature time of the observing-pen, gives the time required for the ear to execute its office, and for the nerves obedient to the will to execute the record. A like process, which it is quite unnecessary to describe, gives "personality of touch."

To the practical astronomer the personality of eye and ear are alone important; to those who have adopted the American method of transits, the "personality of the eye" remains as the quantity whose value and variations it is required to determine.

Our regular observations have been continued daily, with few exceptions, through some 60 or 70 days, my assistant, Mr. H. Twitchell, and myself making an equal number of observations to determine the following quantities:—

1. Absolute personality of eye.
2. Absolute personality of ear.
3. Observed moment of transit.
4. Observed moment of emersion.
5. Observed moment of immersion.

These constitute the regular observations. Besides these, I have obtained the "eye and ear personality" of about thirty persons (not observers) of each sex, and of ages from fourteen to seventy-five years. Among these individuals I find thus far no law which seems to govern the personality. The range is small, as the personality of eye varies between the lowest limit 137 thousandths of a second, and the highest,

214 thousandths of one second of time. The personality of ear has for its least amount 137 thousandths of a second, and for its greatest limit, 223 thousandths of one second of time; and each of these limits belongs to the same two observers.

The mean personality of my own eye, as obtained from 255 observations, is 161 thousandths of a second. The mean personality of my ear, as obtained from an equal number of measures, is 164 thousandths of a second. These same quantities for Mr. Twitchell, as given by the same number of observations on the same days with my own, are for the eye, 144, and for the ear, 153 thousandths of one second of time.

My minimum "eye personality" is 139 thousandths of a second, the maximum reaches to 191 thousandths. My minimum "ear personality" is 143, my maximum "ear personality" is 193 thousandths of one second of time. The same quantities for Mr. Twitchell are for

	s.		s.
The eye, minimum, .	0·118	maximum, .	0·184
" ear, " .	0·129	" .	0·201

Having reached the above results, I was now curious to learn whether the eye and ear were steady for very short periods of time. For this purpose my assistant and myself each made five series of ten observations, each on alternate minutes, which being continued several days, showed that we were liable to a variation of "eye personality" amounting to about two hundredths of a second on the mean of ten observations. I also found that the difference already established between Mr. Twitchell and myself was confirmed in these observations.

I will simply remark, that the sense of touch gave results almost identical with those of the eye; and this fact being soon discovered, the observations for personality of touch were discontinued.

Thus far we have presented results obtained by the eye, in seizing an almost instantaneous movement, the sudden darting of a white line from behind a black screen.

When a comparison was instituted between the absolute and observed moments of transits of the artificial stars, I found, much to my surprise, that both my assistant and myself largely *anticipated* the true time; and that in every instance, without one exception, the same fact was noticed in other persons, who were ignorant of what they were doing, while recording their transits.

After learning the fact of this unconscious anticipation, efforts were made to cure the evil by special attention. To some extent this was done, but the tendency was to an immediate relapse the moment special attention was discontinued. I find (on a mean of ten observations) my own anticipations amounting to the tenth of a second of time in more than one instance, while Mr. Twitchell's error is nearly as large. The variations from day to day, and from observation to observation in the same set, were far larger than I had anticipated.

This gave rise to the observation of "emersions" of the artificial stars from behind a dark screen. Here I found a steadiness in the results precisely equal to the performance of the eye as already determined, which for my assistant and myself seems to be the highest limit of attainable accuracy.

The experiments of observed immersion exhibited the fact of a strong tendency to anticipation, and a less degree of steadiness in the work.

I now became anxious to apply the discoveries thus made in some practical manner to our star transits.

For this purpose I have constructed a diaphragm, consisting of eight occulting bars, four on each side of a central spider's line. We observe the emersion from the first bar, both immersion and emersion from the second, third, and fourth bars, the transit of the central wire, the immersion and emersion of the fifth, sixth, and seventh bars, and the immersion on the eighth bar; in this way we make fifteen observations. These bars are about two seconds of time in width, and their intervals about four seconds at the equator. By observing emersion and immersion, we hope to avoid any error arising from stars of different magnitudes, as the longer stars will emerge sooner and disappear later, a mean of the two observations giving us the place of an imaginary wire between the two bars correctly. I can only say that we have had but two nights' work with the new method. The results are highly promising, but too inconsiderable to communicate.

Proceedings of the Royal Astronomical Society, June, 1858.

Cincinnati Observatory, May 16, 1858.

Enamel without Lead on Bar and Sheet Iron. By M. PLEISCHL.

The author gives two recipes for the enamel, viz:—

1. Silica,	from 30 to 50 parts.	2. Quartz,	from 30 to 50 parts.
Flint,	" 10 to 20 "	Granite,	" 20 to 30 "
Kaolin,	" 10 to 20 "	Borax,	" 10 to 20 "
Pipe clay,	" 8 to 16 "	Glass,	" 6 to 10 "
Chalk,	" 6 to 10 "	Magnesia,	" 10 to 15 "
Pulverized porcelain	" 5 to 15 "	Feldspar,	" 5 to 20 "
Boracic acid,	" 20 to 40 "	Effloresced carb. soda,	" 10 to 20 "
Nitre,	" 6 to 10 "	Lime,	" 5 to 15 "
Gypsum,	" 2 to 6 "	Sulphate of Baryta,	" 2 to 8 "
		Fluor-spar,	" 3 to 10 "

Each of these substances to be powdered separately as fine as possible, mixed carefully and fused with an enamel; this is again ground, and applied to the objects, which are then furnaced. The proportions indicated may vary very much with the different kinds of utensils which are to receive it. The coat should be thin, otherwise it will crack in heating or cooling, and the objects coated should be cooled as slowly as possible so as to prevent the enamel from shrinking irregularly and cracking.—*Bull. Soc. Encour. de l'Indus. Nat.*, (*Paris.*)

Amalgamating Zinc.

M. Berjot has just discovered and communicated to the Academy of Sciences, at Paris, what he considers a new and advantageous mode of amalgamating zinc, by a liquid formed by dissolving 200 parts of mercury in aqua-regio and adding hydrochloric acid. If he will wet his

zinc with the acid, and then rub with nitrate of mercury, he will find less trouble and equally good results. We can hardly believe that the manufacturers of galvanic batteries in France have been in the habit of amalgamating, as M. Berjot states, by immersing the zinc in acidulated water, and rubbing metallic mercury on them with a brush made of fine copper wire. If they have, they have been unaccountably behind the art, and we would recommend M. B's. process to them.

---

*On the Electric Conducting Power of the Metals.** By AUGUSTUS MATTHIESSEN, Ph. D.

The following values for the conducting power of the metals were determined in the Physical Laboratory at Heidelberg, under the direction of Professor Kirchhoff, by the same method as is described in the "*Philosophical Magazine*," February, 1857.

	Conducting Power at Temp. in Celsius's degrees.	
	°	°
Silver,	100	0
Copper, No. 3,	77·43	18·8
Copper, No. 2,	72·06	22·6
Gold,	55·19	21·8
Sodium,	37·43	21·7
Aluminium,	33·76	19·6
Copper, No. 1,	30·63	24·2
Zinc,	27·39	17·6
Magnesium,	25·47	17·0
Calcium,	22 14	16·8
Cadmium,	22·10	18·8
Potassium,	20·85	20·4
Lithium,	19·00	20·0
Iron,	14·44	20·4
Palladium,	12·64	17·2
Tin,	11 45	21·0
Platinum,	10·53	20·7
Lead,	7·77	17·3
Argentine,	7·67	18·7
Strontium,	6·71	20·0
Antimony,	4·29	18·7
Mercury,	1·63	22·8
Bismuth,	1·19	13·8
Alloy of Bismuth, 32 parts, Antimony, 1 part,	0·884	24·0
Alloy of Bismuth, 12 parts, Tin, 1 part,	0 519	22·0
Alloy of Antimony 2 parts, Zinc 1 part,	0·413	25·0
Graphite, No. 1,	0·0693	22·0
Graphite, No. 2,	0·0436	22·0
Gas-coke,	0·0386	25·0
Graphite, No. 3,	0·00395	22·0
Bunsen's Battery-Coke,	0·00246	26·2
Tellurium,	0·000777	19·6
Red Phosphorus,	0·00000123	24·0

All the metals were the same as those used for my thermo-electric experiments, with the exception of cadmium, which was purified by my friend, Mr. B. Jegel.

* From the Lond., Edin., and Dub. Phil. Mag., Sept., 1858.

The alloys of bismuth-antimony, bismuth-tin, antimony, and zinc were determined in order to ascertain whether, as they give, with other metals, such strong thermo-electric currents, they might be more advantageously employed for thermo-electric batteries than those constructed of bismuth and antimony.

Coppers No. 1, 2, 3, were wires of commerce. No. 1 contained small quantities of lead, tin, zinc, and nickel. The low conducting power of No. 1 is owing, as Professor Bunsen thinks, to a small quantity of sub-oxide being dissolved up in it.

Graphite No. 1 is the so-called pure Ceylon; No. 3 purified German and No. 2 a mixture of both. The specimens were purified by Brodie's patent and pressed by Mr. Cartmell, to whom I am indebted for the above.

The conducting power for gas-coke, graphite, and Bunsen's battery-coke increases by heat from 0° to 140° C.; it increases for each degree 0·00245, *i. e.*, at 0° C. the conducting power = 100, and between the common temperature and a light red heat about 12 per cent. The following metals were chemically pure:—Silver, gold, zinc, cadmium, tin, lead, antimony, quicksilver, bismuth, tellurium. Those pressed were sodium, zinc, magnesium, calcium, cadmium, potassium, tin, lead, strontium, antimony, bismuth, tellurium, and the alloys of bismuth-antimony and bismuth-tin. The way in which these wires were made is described in the "*Philosophical Magazine*," for February, 1857.

For the Journal of the Franklin Institute.

Particulars of the Steamer Saxonia.

Hull and machinery built by Caird & Co., Greenwich. Owners, Hamburgh and New York Steamship Co.

HULL.—

Length on deck,	315 feet.	
" " over all,	345 "	
Breadth of beam (molded),	40 "	
Depth of hold,	24 "	
" to spar deck,	32 "	
Draft of water,	19 "	6 inches.
Tonnage,	2500.	
Masts, three—rig, barque.		

ENGINES—Vertical, direct.

Diameter of cylinders,		70 inches.
Length of stroke,	3 feet	6 "

BOILERS—Four—Horizontal tubular.

Number of furnaces—three in each boiler.

PROPELLER.—

Diameter of screw,	12 feet.
Number of blades—three.	

Remarks.—Frames, shape, ⌐; depth, 6 ins.; width of web, $\frac{5}{8}$-in.; width of flanches, 3 ins. Thickness of plates from keel to gunwale, $1\frac{1}{8}$ to $\frac{5}{8}$-inch. Diameter of rivets, $\frac{3}{4}$-inch; distance, $2\frac{3}{4}$-inch—single and double riveted. Independent steam, fire, and bilge pumps, one.

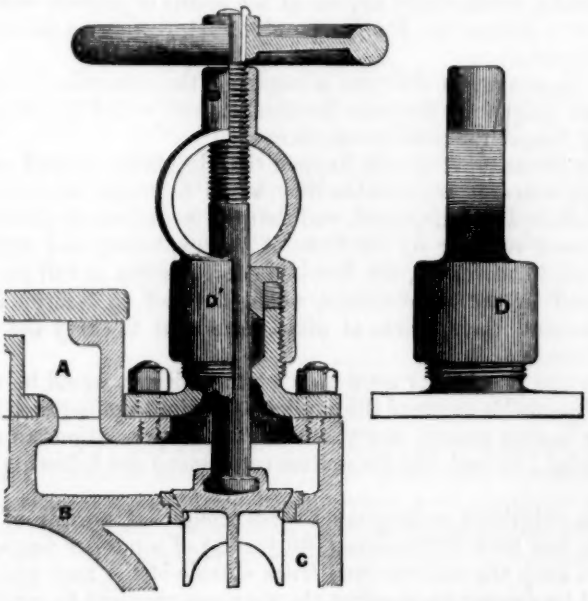
Boilers, chimney, and smoke pipe protected from communicating fire by iron and felt. 6 bulkheads. Water bottoms to boilers. Two fore and aft stringers on spar and main decks, $\frac{1}{2}$-inch by 3 feet; and two (inboard), $\frac{3}{8}$-inch by $12\frac{1}{2}$ inches. Has four decks, and can accommodate 54 first class, 117 second class, and 400 steerage passengers.

C. H. H.

For the Journal of the Franklin Institute.

Combined Nut and Gland for Screw Stop Valves.

Messrs. I. P. Morris & Co., Port Richmond Iron Works, have lately applied to their screw stop valves, a neat and inexpensive substitute for the arch or column and cross-head, generally used to hold the nut for the thread on the stem. The arrangement, which was designed by Mr. Lewis Taws, the engineering member of the firm, will be seen in the cut below, in which it is shown as adapted to a horizontal steam engine; A, B, C, being parts of the steam-chest, cylinder, and passage from the steam supply pipe; and D D′ a brass nut for the screwed stem of the valve, as well as that required for forcing down the gland in the stuffing-box, the threads in both being of the same pitch to prevent jamming when screwing down the packing with the valve seated.



The mechanic will observe readily the ease with which the nut can be finished, and the certainty of all the parts being in line with each other, as all the work can be done in the lathe.

Screw-valves are often fitted with a thread and nut between the valve

and the stuffing-box, but then those parts cannot be lubricated, and are in contact with the steam; consequently they quickly wear and corrode. These serious defects are avoided by the plan shown in the cut.

The shape of D D′ may be varied to suit the taste; it is important, however, that somewhere between the nuts, D and D′, apertures should be made for the escape of any steam leaking through the stuffing-box, so as not to compel it to pass through the nut, D, thereby rusting out the thread. J.

Danger of Telegraph Wires in the Vicinity of Depôts of Gunpowder.

Report of a Committee of the Academy of Sciences of Paris.

M. le Marechal Minister of War, wrote to the Academy for the purpose of consulting it on the question whether the passage of telegraph wires in the vicinity of a powder magazine could be a source of danger. The committee appointed to prepare a report on this subject, submit it for the approbation of the Academy.

It considers as certain, that the electric currents developed in the telegraph wire for the usual transmission of despatches can never produce accidents; for supposing even that the wires should be broken during the transmission, either by the wind or by any other cause, the small sparks which might appear at the points of rupture would be insufficient to inflame the floating powder-dust, resting on the wires or on their supports.

But it is altogether different in regard to the atmospheric electricity; its action frequently becomes formidable, and would be an imminent cause of danger for powder-magazines.

If, for instance, it should happen that lightning should strike the telegraph wires, it is probable they would be fused for a certain distance, inflamed and dispersed, and that the incandescent globules might be dispersed very far by the force of the explosion, and still farther by the wind; moreover, the free ends of the wires in full combustion, and urged by the same causes, would not fail to describe extensive curves around their points of attachment and to carry the flames to great distances.

Were this probability even only a possibility, it would be nevertheless indispensable to guard the powder magazines against such a danger.

After having passed in review the various precautions to which recourse might be had, the Committee recommend the following arrangements.

1. To substitute underground wires along that portion of the line which is less than 100 metres (100 yards,) of a powder magazine.

2. To keep the underground track outside of the zone within which it would be dangerous to admit the workmen required to construct, examine, or repair it.

3. To establish one or more lightning rods, upon poles of 15 or 20 metres (50 to 65 feet,) in height, near these underground wires, so as to protect their whole length against the direct stroke of the lightning.

They propose to the Academy to approve of these depositions, which appear to us to be the most suitable to give every security to the administration of war, without imposing too great a tax on the administration of the telegraphs.

COMMITTEE.—*MM. Becquerel, Regnault, Despretz, de Senarmont, Marshal Vaillant Pouillet Reporter.*

After some explanations given by the reporter in answer to remarks of MM. Le Verrier and Piosert, the Report was adopted.—*Comptes Rendus, August* 16, 1858.

—

[We do not know that any objection can be taken to the principal recommendations of the above Report, although they will be entirely useless for powder magazines, (for which it appears they are intended,) since we see no reason for supposing powder dust to settle on the wires, or to be suspended in the air near magazines. Near powder-mills, no doubt there is utility in the suggestion. As to the lightning rod, direct experience has demonstrated their danger unless they be connected with the metallic masses which form part of the magazines. If there be, for instance, an iron magazine, or one in which iron beams or metal roofing are used, the danger from the vicinity of the lightning rods near enough to excite induction, but not metalically connected with it, will be far greater than from any telegraph wire. ED.]

Water-proofing Stuffs.

Take a pound of gelatine, and a pound of neutral tallow-soap; melt them in 4½ galls. of water, and add little by little 1½ lbs. alum; continue to boil for a quarter of an hour; wait until the milky-looking liquid has come down to 113°, then plunge the stuff into it, allowing it to become well soaked. Take it out, let it drip, and dry it completely by hanging it up without wringing; wash it carefully, dry it again, and calander it. The soap must be made with tallow, for no other fatty matter will remain suspended in the gelatine.—*Bull. Soc. Encour. de l'Indus. Nat., (Paris.)*

---

*Process for Decolorizing the Fatty Oils.** By C. BRUNNER.

As in all the fatty oils which he treated, the author remarked, that after the evaporation of the ether, they were obtained of a much lighter color than when first employed, in some cases even perfectly limpid, he endeavored to discover a general process for bleaching the fatty oils in this way. This object was completely attained in many cases by proceeding as follows:—

The oil is made into an emulsion with water, to which the proper consistence is given by gum or starch-paste, and this emulsion is well worked up with thoroughly ignited charcoal, coarsely powdered and freed from fine dust by sifting. To 1 part of oil about 2 parts of char-

* From the London Chemical Gazette, No. 381.

coal powder are taken. The doughy mass is allowed to dry thoroughly at a temperature which should not exceed 212° F., and the oil is subsequently extracted with ether in the cold in a displacement apparatus. After this extract has deposited any charcoal powder that may have passed through during the extraction, it is put into a retort, and the ether is distilled off in the water-bath. In this way olive oil and walnut oil are completely deprived of color.

It might perhaps be supposed that the charcoal has a direct decolorizing action in this case upon the oil, just as in many cases it clears many aqueous fluids. This, however, is not the case. Oils left in contact with charcoal for weeks together did not undergo the least decolorization, even when they were dissolved in ether and digested with charcoal. The presence of the water contained in the emulsion appears first to give rise to the action. It is probable that by the preparation of the emulsion, the coloring matter, which does not belong to the oil itself, is taken up by the water and afterwards absorbed by the charcoal.

The action may be similar to that set up in the operation employed by painters to bleach oils, which consists in agitating the oil sufficiently with an equal volume of water, and exposing the mixture to the sun. The water, which soon separates again from the oil, appears turbid, and often mixed with slimy flakes. The operation is repeated for weeks, the water being frequently renewed, until it is no longer rendered turbid, and the oil appears limpid.

In the above process the essential part appears to be the complete desiccation of the charcoal mixed with the emulsion. If the oil be extracted with ether before this is the case, it is obtained again with its original color.

Lastly, it is to be remarked that by this process the oils undergo a very remarkable thickening. Thus walnut oil is obtained nearly of the consistence of butter.—*Bremer Mittheilungen*, Dec. 1857.

Mode of Preserving Photographs on Paper. By M. GAUDINET.

"I dissolve a certain quantity of the gutta percha of commerce in the *Colas* benzine. I decant in a few days, so as to have only the clear portion. I plunge my paper, sheet by sheet, in this solution, and withdraw it almost immediately; then hanging it by a corner, I let it dry. I then present these sheets which contain the gutta percha as a powder, but not as a varnish, to a good fire. The grains of gutta percha unite, and cover the fibres, forming an interior varnish which is nearly impermeable.

I albuminize this paper which has lost none of its transparence (albumen, 100; rain-water, 25; chloride of sodium, 6). I dry it, and render it sensitive by a solution of 15 ℔ cent. of nitrate of silver. I allow it to drip, and dry it by a gentle fire; I produce a positive in the usual way, and fix it by hyposulphite of soda at 10 or 15 ℔ cent.; but this operation is so much abridged, that in a few minutes the proof is fixed

like one on glass, and of a beautiful sepia tint. Nothing prevents the use of chloride of gold if that is desired. The washing may be done in a quarter of an hour, in place of lasting from 12 to 24 hours, and the proof is of admirable transparence, the paper also keeping all its whiteness.—*Comptes Rendus de l'Acad. des Sciences de Paris.*

---

*On the Amount of Caffeine in Coffee-beans** By Prof. A. VOGEL, Jr.

The method hitherto employed for the extraction of caffeine from coffee beans or tea leaves, is both complicated and uncertain. It consists in extracting the coffee beans with water, precipitating the tannic acid from the solution by lead salts, and evaporating only the solution freed from lead for crystallization. This method is exceedingly inconvenient, and this is probably the principal reason why the statements as to the amount of caffeine in coffee differ so much from each other.

The following method appears to the author to be much simpler and to lead to more accurate results. It is founded on the treatment of powdered coffee beans with commercial benzole. This extracts two constituents from the coffee—oil of coffee and caffeine. After the evaporation of the benzole, these two substances may be easily separated from each other by agitation with hot water, in which the caffeine dissolves, whilst the oil floats on the surface and may be skimmed off. The caffeine is obtained by the evaporation of the aqueous solution, in very beautiful crystals, which may be sublimed.

The whole of the benzole may be recovered, by distilling it in a retort, after it has stood about a week upon the coffee beans. The residue in the retort is the oil of coffee and caffeine, which may be separated as above by agitation with water, or by treatment with ether, which dissolves the oil and leaves the caffeine in crystals. By this method oil of coffee and caffeine might be obtained as subsidiary products in benzole manufactories.—*Kunst-und Gewerbeblatt für Bayern*, 1858.

* From the London Chemical Gazette, No. 377.

Destruction of Insects.

M. Millot Brulè exhibited before the Imperial Central Horticultural Society, of Paris, the efficacy of the powdered proto-sulphuret of iron, (which has been before used for the preservation of timber,) in destroying noxious and annoying insects.

The powder may be strewed over the ground around the roots of the tree, or fixed on the surface of a collar surrounding the stem: no insect will pass it, or if they attempt it they are immediately killed. The proto-sulphuret of iron (black pyrites,) occurs as a mineral in various parts of France and Germany, and is manufactured for the purpose of developing sulphuretted hydrogen, which is undoubtedly the effective agent in destroying the vermin.—*Cosmos.*